New se 1. H 42—30,00[illegible]—3[illegible]-1 56. Sectt. H-74—

C. No. 5[illegible]

[illegible] Department.

List of records put up.

Number.		Clerk paper.
	FOR MYSORE STATE	

(P.T.O.

URGENT.

M.(W):

I am told that the papers pertaining to the development of Mangalore Port to be sent by this Govt. to the Govt. of India have long been pending here. This matter may be expedited and I would also like to see the concerned file.

Minister (Health) 14/9/56

7028/15.9.56

Secs. PWD

1528

Minister (W)

SECRETARY TO GOVERNMENT 15 SEP 1956 PUBLIC WORKS DEPARTMENT

15.9.56

1524

PWD(F-1).

This file relates to the question of developing the Mangalore Port into a major Port, or into an all weather Port.

2. In order to enable a decision to be taken in regard to the development of the Port, ~~Model~~ model experiments were conducted at the Central Water and Power Research Station, Poona, and the experiments have now been completed. Only two reports in regard to the experiments have however been received so far. From the references on pp.43 and 45 cf., it will be observed that ~~one~~ a further report is still due.

3. In their letter on p.33 cf., the

× Pl. see 'B' on p 43 c/z

Δ at (N) & (Y)

Pl. see 'C' on p 43, and p 45 c/z

Government of India requested that if the Poona Research Station has submitted its report of the results of the investigations carried out at that station concerning the Mangalore Port, a copy thereof may be furnished to them, with the comments of the State Government. The Director, Central Water and Power Research Station, Poona, was accordingly requested to furnish this State Govt. with two complete sets of the Reports, after all the experiments were over. The reports have not so far been received. The Director was remined last on 25-8-1956.

4. From the conclusions arrived at in Specific Note No.374 dated 17-12-1955 of the Director, Central Water and Power Research Station, Poona, it would be observed that maintenance of a channel at the Port to admit throughout the year ships having a draft varying between 21 to 24 feet would be possible, and that further dredging of the channel to admit ships of greater draft would not be an economic proposition and would also be physically impossible. This will show that while it would be possible to develop the Mangalore Port into an all weather port for the use of ships having a draft varying between 21-24 feet, it would not be possible to develop the port into a major port admitting ships of greater draft. Based on the above conclusion, the Mangalore Port Trust Board requested the State Government to move the Government of India —

(i) to include the development of the Mangalore Port into an all weather port in the Second Five Year Plan;

and ..

(ii) to immediately appoint a competent Harbour Engineer to prepare a lay out of the proposed harbour with detailed plans and estimates so that orders for necessary plant etc., could be placed without any delay.

The State Port Officer who was referred to in the matter has stated that although an all weather port at Mangalore for steamers drawing upto 22 feet is very favourable, any further development to permit deeper draft ships would be out of the question. He has therefore suggested that if the port to be developed in the West Coast should be able to accommodate all draft ships, then in view of the fact that the majority of the cargo to be exported and imported would be from and to the hinterland, the question of developing Malpe should atleast be looked into, especially in view of the recommendations of the West Coast Major Port Development Committee. On the otherhand, if an all weather port to accommodate ships upto 22 feet draft is required, he has stated that Mangalore would be suitable for such a port. Further consideration of the question has been deferred pending receipt of a complete set of the report of the results of the model experiments from the Director, Central Water and Power Research Station, Poona.

[redacted]

5. A reference is in this connection invited to the report of the West Coast Major Port Development Committee regarding the possibility of ~~siting~~ siting a major port on the West Coast between Mormugao and Cochin. The Committee was of opinion that a deep-sea port between Mormugao and Cochin for the accommodation of ships of larger size and tonnage at all seasons of the year is necessary and that such a port should be situated at Malpe. Before arriving at the above decision the Committee considered the suitability of Mangalore for siting

such a port, but decided that Mangalore would not be suitable for the purpose. One of the reasons for turning down the proposal was the element of doubt regarding the possibility of maintaining a dredged channel throughout the year at Mangalore even at the cost of heavy dredging. The model experiments at Poona have conclusively proved that it would not be possible to maintain at Mangalore a dredged channel capable of admitting ships having a draft of over 24 feet. In another connection the Government of India have stated that the question of developing Malpe into a major port would be considered after the Mangalore experiments are over and their results studied. Whether it would be sufficient--

(i) to develop only Mangalore into an all weather port for accommodating throughout the year ships having a draft upto 24 feet;

OR

(ii) whether the port of Malpe should be developed instead to accommodate throughout the year ships of larger draft and tonnage;

OR

(iii) whether both Mangalore and Malpe should be developed into all weather ports;

are matters of policy of great moment, on which it is not desirable for the State Government to take a decision, in view of the fact that both the ports will go to the Mysore State with effect from the 1st November 1956. It is therefore for consideration whether the above question may be left to the Govt. of Mysore to decide after the 1st November 1956.

6. The file may be ciroulated to M(W) and M(H) for information with reference to the minutes of

P.T.O.

2448
p4 ante

M(H) on p.1 ante and for orders on the point raised in para 5 above.

T.M.K. 24512
20/9/56
DNB 21.9.56.

M.V.Rangaviviam 24.9.56 D.S. / S

[illegible]

[illegible]

[illegible]

Telephone No.2629.
Telegraphic Address:
C.P.R.S.

GOVERNMENT OF INDIA
CENTRAL WATER AND POWER RESEARCH STATION.

No.172/4452. Poona,
19th May 1955.

To
The Honorary Secretary,
The Kanara Chamber of Commerce,
P.B. Box No.116,
Mangalore : 1.

Please refer to your letter of 4th May 1955. I am enclosing a note giving the progress so far achieved regarding model experiments carried out in connection with the development of Mangalore Port.

Yours faithfully,

D.A.)
One Note.)

(Sd) D.V.Joglekar,
Director.
C.W.P.R.S. Poona.

Copy, with compliments, to the C.R.O. (N), Khadakvasla, with a copy of the note under reference.

Copy together with the copy of note forwarded to the Port Officer, Mangalore for information.

(Sd) C.V.Gole,
for Director,
C.W.P.R.S.Poona.

Mangalore, 16.6.1955.

II.

To. 8u0/55-1

Copy together with copy of note referred to therein submitted to the Secretary to Government, Public Works Department, Madras for favour of information.

Port Trust, Mangalore I.)
P.B.No.146,)
Dated 17th June 1955.)
NA.17/6.

for Chairman.

PWD(F1)

Filed after perusal.

CENTRAL WATER AND POWER RESEARCH STATION, POONA.

A Brief Note giving the experiments carried out so far in connection with the development of Mangalore Port.

A model of Mangalore Port has been constructed to a scale of 1/250 : 1/50 at the Central Water and Power Research Station, Khadakwasla, Poona. The model was first proved in respect of tidal and wave characteristics, flow conditions, velocity distribution, bar formation etc. for fair weather and monsoon conditions.

After verification of the model, experiments have been started to study the various proposals. There are mainly the following 3 proposals to be studied regarding the development of Mangalore Port as an all weather or a major port.

Proposal 1: To dredge an approach channel through the existing bar and locate the harbour basin either on the Netravati or the Gurpur river. The same proposal also to be tested with Gurpur diverted above Sultan's Battery.

Proposal 2: To isolate both the rivers, and dredge a channel through the sand spit and locate the port in the tidal basin.

Proposal 3: To locate the harbour basin on the Gurpur River, dredge a channel through the sand spit and isolate the Netravati River only.

Proposal (1) was first taken up for study. In the first series of tests, tests were made with an approach channel which would permit 30 ft. draft throughout the year. The proposal was studied with the harbour basin on the Netravati River and the Gurpur River separately. These experiments showed that the channel may have to be initially dredged to 40 ft. as it was observed that during monsoon silting to the extent of 10 ft. took place in various reaches of the approach channel. The maintenance dredging was found to be approximately 52 million cubic ft. The proposal was also further studied with the diverstion of the Gurpur River. This showed that under this condition, the silting further increased as the scouring power of the Gurpur River was not available for flushing the approach channel. It was also observed that merely, a dredged channel would not be maintained without breakwaters. The length of breakwaters necessary was found to be about 4,000 ft.

A similar study was carried out for the proposals to maintain a channel which would give 22 ft. draft throughout the year. This proposal also was tested with harbour basin on the Netravati and the Gurpur Rivers. Experiments showed that the proposal to locate the harbour basin in the Gurpur River, with both the rivers flowing, would require less maintenance dredging viz., 17.6 million cubic ft. This requires breakwater lengths of only 2,000 ft. The silting in the harbour basin was also very small as the quantity of sediment load brought down by the Gurpur river is much less than that brought down by the Netravati River. The Netravati river is estimated to carry about 20 million cubic ft. of bed load against 3 million cubic ft. estimated from the Gurpur river. It would be therefore desirable to locate the basin on the Gurpur River, so that the maintenance dredging from the basin would be minimum. To maintain a draft of 22 ft. throughout the year, the channel may have to be dredged to 27 ft. allowing for silting and extra draft required for swell conditions. There would be a slight difficulty of navigating the ships with the harbour basin on the Gurpur as the ships may be required to face a broad side current and have to take an abrupt turn to enter the basin. This point was discussed with Mr. Cornish, State Port Officer and Mr. Hardas, Port Officer and they expressed the opinion that there would not be insurmountable difficulties for navigation. This proposal which showed promising results was studied in detail with permutations and combinations of various factors at work. The effect on the approach channel as a result of the variations in the width of the mouth, various directions of waves with different characteristics, the effect of various breakwaters etc. were studied.

The

The size of stone required for breakwaters is being studied in a 200 ft. long wave flume. The experiments are in progress.

In connection with this study, analysis of various factors affecting the harbour, like the bed load of the rivers, wave action, river discharges, tidal influx has also been carried out. The data regarding wave characteristics reported by ships for the period 1949-53 was collected from the Meteorological Department and is being analysed by the statistical division for the various characteristics of waves such as their period, height, wind direction and speed etc. This study has revealed some of the interesting features of the Arabian Sea. This shows that the predominent direction of waves during monsoon is west-south-west to west and then this direction gradually changes to north-west during the non-monsoon period.

In connection with these studies mentioned above, the littoral drift is one of the important factors affecting the silting of the approach channel. There are no accurate methods by which this can be estimated properly. The only way to estimate it accurately is by constructing some groynes projecting in the sea and observing the coastal changes near the groyne for two seasons.

In one of the inspection reports this suggestion was already made. In view of the heavy cost involved this has not been implemented though it would be desirable to do it for an important project like this for which littoral drift estimate has to be fairly accurate. Some observations of coastal changes before and after monsoon were made at the projection of the rocks at Someswar Temple. As this projection of rocks is very small, this does not throw sufficient light on the littoral drift.

The proposal which has so far shown promise will now be studied with a vertical exaggeration of 2.5 to study the effect of model scales on wave characteristics. The model bed is being accordingly moulded for this purpose at present.

The proposal of development of Mangalore Port either as an all-weather port or a major port can be finalised only after completion of all the experiments involved in other two proposals.

NA.16/6.

/True Copy/

R. Gittardas 18/6
Secretary.
Mangalore Port Trust.

Government of India
Central Water and Power Research Station
Post Box No.18.
-.-.-.-

No.379/1137 of 1955. Poona-1, 23 DEC 1955

To

The State Port Officer,
Post Box No.13,
Madras-1.

Subject:- Specific Note No. 374
dated 17-12-1955

Sir,

(N) I am enclosing a Specific Note No. 374 of 1955 covering the experiments carried out in connection with the approach channel through existing entrance.

2. Experiments for the Channel through the sand spit have been started and the results of these experiments would be intimated to you in due course.

Encl-
1 specific Note

Yours faithfully,
D. V. Joglekar
Director, CW&PRS.

Copy with compliments to:-

1) Deputy Secretary to the Government of Madras, Public Works Department.

2) Port Officer, Mangalore.

P.W.D.(F.)

E/-21/11/55

filed pending the receipt of the report referred to in para 2 above.

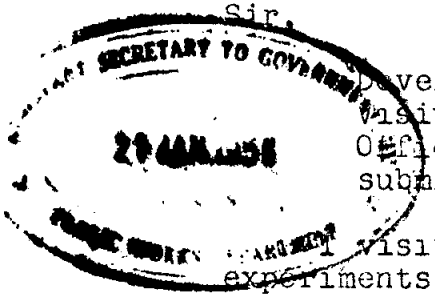
From:
L.H.Cornish Esq.,
State Port Officer,
P.B.No.13,
Madras-1.

570

To:
The Secretary to Government,
Public Works Department,
Madras.

No.3423 G1/55-2 dated 20th January 1956.

Sir,



Development of Mangalore - Model experiments at Poona - Visit to the Research Station, Poona by the State Port Officer (G.O. Rt. No.33 P.W. dated 10-1-1956) - Report submitted.

--

I visited Poona on January 15th and 16th 1956. The model experiments are now practically complete and the final report fr the Director, Central water and Power Research Station, Poona, m be expected by about the end of next month.

2. From the experiments, it has been found that the existing entrance improved by groynes is the best method for providing an all-weather port at Mangalore. I was also informed that the de of water which could be maintained in the entrance channel would be approximately between 21 and 24 feet depending on the state o tide and that further deepening of this channel would not be economical or physically possible.

Yours faithfully,

State Port Officer.

AT/20.

716

FINAL NOTE ON MANGALORE PORT

1. Mr. Cornish and Mr. Advani of Mangalore Port visited the Research Station on 15th and 16th January 1956 and they were shown the working of the Mangalore Port Model

i) with the approach channel in the sand spit, Netravati isolated and Gurpur flowing through the approach channel;

and ii) both the rivers isolated and approach channel connected to the inner lagoon.

2. In the first proposal, even 22 ft. (below L.W.O.S.T.) depth of approach channel is difficult to be maintained due to less flushing dose from the Gurpur being available and heavy silting would occur in the approach channel, especially in the portion outside the breakwaters. If 22 ft. depth has to be maintained, then the length of the breakwaters will have to be increased from 2000 ft. to 4000 ft. or even more. With 15 ft. depth approach channel, conditions are quite comparable with the proposal of the approach channel through the existing gut so far as the length of the breakwaters is concerned viz. 1000 ft.; but the approach channel outside the breakwaters would be silted and a lunet type bar will form outside the breakwaters. Incidentally, it may be mentioned that with this proposal, the high flood level of the Gurppr will be reduced by 3 ft. at Malavuru.

3. Regarding the second proposal in which both the rivers are isolated, experiments show that it will be very difficult to get even 15 ft. depth and there will be constant silting outside the breakwaters which will be physically impossible to dredge immediately after the monsoon. Besides, fairly heavy wave action was seen in the basin due to lower velocities in the approach channel. With this proposal, the H.F.L. of the Gurpur will be further reduced by 6".

4. Considering all factors, the proposal of ar

channel through the existing gut with breakwaters is the best.

To recapitulate the findings of this proposal

i) If the channel is initially dredged to 29.5 ft., it is likely to silt by 5.5 ft. by the end of December when a dredger can go out for dredging. This allows for the silting of the order of 1'-6" which may occur in the months of October, November and December. This means that the port can admit ships having a draft varying between 21 ft. to 24 ft. depending upon the state of tide in the port.

ii) The dimensions of the approach channel will be 400 ft. width at the bottom with 1 in 10 side slopes and the distance between centre to centre of breakwaters will be 1250 ft.

To excavate a deeper channel still further so as to admit deeper draft ships will be uneconomical and will also not be physically possible for maintenance due to inability of a dredger to work immediately after monsoon on account of unfavourable conditions of the sea.

5. The models have confirmed earlier findings regarding the relation between the cross sectional area of the approach channel and tidal capacity of the rivers. Theoretical calculations have shown that with the available tidal capacity of the Netravati and Gurpur rivers, the depth in the approach channel would be of the order of 20 ft. with breakwaters and without any dredging.

6. Flume experiments are in progress in which design of breakwaters are being tested. In these

experiments ....

experiments, various types of armour are being tested viz. cubical concrete blocks, Tetrapods (Neyrpic patent) and Hexapods.

7. The following points regarding the development of the harbour were brought out after discussion with Mr. Cornish and Mr. Advani.

There are three alternative sites for building the port:

1) Siting the wharves between the existing north wall and sultan Battery,

2) Siting the wharves on the sand spit side,

& 3) Siting the harbour on the south-west side of the Netravati river between the gut and the bridge.

In the case of alternative 1), even though we may reclaim a strip of land 300 ft. wide for transit sheds, roads, railways, wharves etc., there will be still limitations to expanding the port in future and also interference of water frontage of various existing tile factories. If these objections can be overcome, then this will be by far the best site.

As regards alternative 2) i.e. developing the port on the sand spit side, there will be plenty of land available for expansion of activities after reclamation but there will be some difficulty of taking the railway line across the river. As regards the best alignment of railway, this question will have to be examined on site.

Regarding the Netravati basin, this appears probably the best of the three alternatives from the following points of view:

i) It is understood that a road bridge is going to be constructed across the Netravati in the near future so that there will be easy communication between the town and the port.

ii) Ample space available for expansion of the port on south west side.

& iii) Manoeuvring of ships in and out of the port will be much easier, but maintenance dredging will be very extensive -- nearly three times than that obtained with the harbour basin in the Gurpur river.

8. When a final decision regarding the development of the port is taken by Government, the groyne as already suggested by the Station may be constructed near Someswar temple. The results of these experiments will be advantagous to determine site for dumping dredged material and also to see whether the sand spit requires any protection.

-.-

GOVERNMENT OF INDIA
CENTRAL WATER & POWER RESEARCH STATION
POST BOX NO. 18, POONA.

No,179/699 of 56. Poona, 20 JAN 1956

Copy, with compliments, to :-

1) The Secretary to the Government of Madras, PWD, Madras.

Detailed reports on experiments with approach channel through sand spit with and without the Gurpur river will be sent in due course.

2) Mr. L.H.Cornish, State Port Officer, Madras

3) Mr. M.L.Advani, Port Officer, Mangalore.

D. V. Joglekar

P.W.D.(F1) Director, CW&PRS., Poona

pp. 7-15 above

Subd. for perusal. The report mentioned at 'A' above may be awaited till 1.4.56.

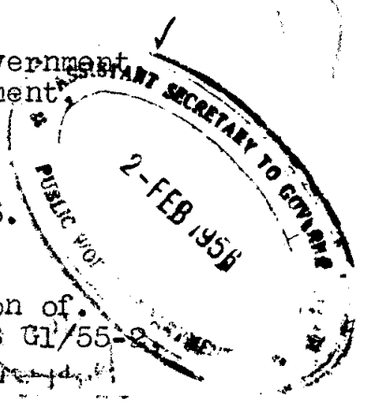
30.1.56

2.2.56

2.2.56

From
L.H. Cornish, Esq.,
State Port Officer,
P.B.No.13,
Madras -1.

To
The Secretary to Government,
Public Works Department,
Madras.



No.244 G1/56-1, dated 21-1-1956.

Sir,

Sub:- Mangalore Port Model - Retention of.
Ref:- My letter to Government No.3423 G1/55-2, dated 20-1-1956.

In continuation of my letter cited, I forward herewith a copy of letter No.179/768 of 56 dated 23-1-56 received from the Director, Central Water and Power Research Station, Poona, on the above subject and suggest that the model may be retained until a final decision is taken by Government on the development of the Port of Mangalore as further experiments may be necessary, especially as the cost of maintenance of the model will be Rs.125/- only per mensem.

2. During my visit to the Research Station at Poona on the 15th and 16th January 1956, it was found that the approach channel through the existing entrance was the best.

3. In these circumstances, I request that Government will be pleased to inform the Director, Central Water & Power Research Station, Poona, approving the decisions mentioned in his letter referred to in para 1 above.

Yours faithfully,

3/1 State Port Officer.

Encl.(1)

Encl.
From the Director, Central Water & Power Research Station, Poona,
To the State Port Officer, Madras,
No.179/768 of 56 dated 23-1-56.

Sub:- Mangalore Port Model.

During your recent visit to the Station in connection with Mangalore Port Model, the question for retaining the model was discussed as most of the experiments are expected to be completed soon. It was decided that the model should be retained until it is no longer required by you. The cost of maintenance of model will be about Rs.125/- p.m. and the cost will be met from the balance of your deposit which may remain outstanding with us from the estimate of Rs.1,45,298/-.

As the proposal of the approach channel through the sand-spit with or without the Gurpur river does not show promising results, it was decided that the position of wave generators may be shifted back for the approach channel through the existing entrance. This may please be confirmed.

(True copy)

4/1 State Port Officer.

P.31.

Very Urgent

P.W.D.(F.I)

Endt. 51821 F/55-1. dt-8-2-56.

Referred to the C.Man. P.T. for remarks.

7/2/56

7.2.56

8.2.56

To

The C.Man. P.T.

13.2.56

EXPRESS

Subject: Mangalore Port - Development into an All Weather Port - Final note on experiments conducted at the Central Water & Power Research Station -

Ref: Endorsement No.179/699 of 1956 dated 20.1.1956 from the Director, Central Water & Power Research Station, Poona to the the Secretary to Government Public Works Department, Madras.

****

MANGALORE PORT TRUST

No. 235/567

P.B.No.146, Mangalore I.
Dated 15th February 1956

To

The Secretary to Government,
Public Works Department,
M A D R A S .

Sir,

With reference to final note on Mangalore Port Model Experiments conducted at Central Water & Power Research Station, Poona I enclose herewith a copy of Board's Resolution No.249(2) dated 14.2.1956.

In this connection I am to invite a reference to proceedings of the fifth meeting of the National Harbour Board communicated in G.O.Ms.No.189 dated 12.1.1956 wherein the National Harbour Boa during its deliberations has expressed that the question of furth development of Mangalore into a Major Port would have to be exami ed after the result of Model Experiments at Poona became available

The model experiments at Poona are now practically over and as a result of these experiments it is conclusively proved that Mangalore Port can be developed into an All Weather Port to admit ships having a draft varying between 21 feet to 24 feet dependin upon the state of tide without any difficulty. In view of these very encouraging results of the experiments the Board has desired me to request the Government to use all its influence to move t Union Government to include the development of Mangalore Port an All Weather Port in the second five year plan. The Board has also desired me to request the Government to move the Union Gove ment to immediately appoint a competent Harbour Engineer to prep a lay out of the proposed harbour at Mangalore with detailed pla and estimates so that the orders for necessary plant etc. can be placed without any delay and the scheme pushed through during th Second Five Year Plan period. The Board is willing to bear the c of preparing the lay out plans and estimates if necessary and provide a sum of Rs.50,000/. for this purpose during 1956-57.

I request that the Government may be pleased to consider proposals of the Board favourably and prevail upon the Union Government to include the development of Mangalore Port into a All Weather Port during the Second Five Year Plan and also to immediately appoint a competent Harbour Engineer to prepare a out of the proposed harbour at Mangalore with detailed plans a estimates so that the orders for necessary plant etc. can be pla without any delay and the scheme pushed through during the Secon Five Year Plan period.

Yours faithfully,

CHAIRMAN,
Mangalore Port Trust.

Copy

Copy of Resolution No.249 of the Mangalore Port Trust Board, dated 14th February 1956.

******

249(2): Final note from the Director, Central Water & Power Research Station, Poona on the Model Experiments of the Mangalore Port conducted at the Research Station.

Read Proceedings of the Port Development Committee of the Mangalore Port Trust Board held on 30.1.1956:

x x x

Agenda: Final note from the Director, Central Water & Power Research Station, Poona on the Model Experiments of the Mangalore Port Conducted at the research station.

Resolution: The report of the Director, Central Water & Power Research Station, Poona has conclusively proved that Mangalore can be developed into an all weather port without any difficulty. The State Government may be requested to use all its influence to move the Union Government to include the Development of Mangalore Port into an All Weather Port in the Second Five Year plan ~~and also the provision of Railway link between Hassan and Mangalore~~. The State Government may also be requested to move the Union Government immediately to appointment a competent Harbour Engineer to prepare a lay out of the proposed harbour at Mangalore with detailed plans and Estimates so that orders for necessary plant etc. can be placed without any delay and the schems pushed through during the second five year plan. The Board may if necessary undertake to bear the cost of preparing the lay out, plans and Estimates and set aside a sum of Rs.50,000/. for this purpose during 1956-57.

Board's Resolution:

2. Resolved that in view of the report of the Director, Central Water & Power Research Station, Poona, having conclusively proved that Mangalore can be developed into an All Weather Port without any difficulty, the State Government be requested to use all its influence to move the Union Government to include the development of Mangalore Port into an All Weather Port in the Second Five Year Plan. The State Government may also be requested to move the Union Government to immediately appoint a competent Harbour Engineer to prepare a lay out of the proposed Harbour at Mangalore with detailed plans and estimates so that the orders for the necessary plant etc., can be placed without any delay and the schems pushed through during the second Five Year plan period. The Board is prepared to bear the cost of preparing the lay out plans and estimates if necessary and provide a sum of Rs.50,000/. for this purpose during 1956-57.

NA.15/2

DESPATCH BRANCH

Encl. No 5182 F/5572 dt 23.2.56

P.W.D.(T.)

Referred to the S.P.O. for remarks.

23.2.56

To

Copy to Dept 19-20.

Mangalore Port - Model experiments at Poona - Letter No.179/768 of 56 dated 23.1.1956 from the Director Central Water & Power Research Station, Poona - Government Endorsement No. 51821 F/55 dated 8.2.1956.

****

MANGALORE PORT TRUST

No. III/56-1

P.B.No.146, Mangalore I.
Dated 17th February 1956.

To

The Secretary to Government,
Public Works Department,
M A D R A S .

ASST. SECRETARY TO GOVERNMENT 1498

Sir,

I enclose a copy of Board's Resolution No.249(3) dated 14.2.1956 together with a copy of Port Development Committee's Resolution read therein and request that the Government may be pleased to accept the proposal of the Director, Central Water & Power Research Station, Poona to shift the position of wave generators back for the approach channel through the existing entrance and retain the model until it is is no longer required at a cost of about Rs.125/. per mensem.

The experiments at Poona are expected to be completed shortly and it is understood that there would be some balance from the deposit of Rs.1,45,298/. made with the Director Central Water & Power Research Station, Poona due to the Board. I suggest that if the Government agree the Director, Central Water & Power Research Station may be requested to refund the balance of deposit on completion of experiment retaining sufficient funds for maintenance of the model until 31.3.'58.

Encl:
Board's Resolution No.249(3)
dated 14.2.1956.
Resl. No.3 dated 30.1.56
of Development Committee.

Yours faithfully,

CHAIRMAN.

Copy to the Director, Central Water & Power Research Station, Poona.

Copy to the State Port Officer, Madras.

Copy of Resolution No.249(3) of the Mangalore Port Trust Board, dated 14.2.1956.

*****

249. Proceedings of the Port Development Committee of the Mangalore Port Trust Board held on 30.1.1956:

Agenda (3) Proposals regarding retention of Mangalore Port Model at the Poona Research Station until it is no longer required at a cost of Rs.125/. per mensem and also shifting of wave generators back for the approach channel in the model. Read letter No.179/768/56 dated 23.1.1956 of the Director, Central Water & Power Research Station, Poona.

Resolution: Position of wave generators may be shifted back for the approach channel through the existing entrance and model be retained until it is no longer required and the cost of Rs.125/. per month for maintaining the model be met by the Port Trust from the surplus funds remaining with the Research Station.

Resolution of the Board:

(3) "Port Development Committee's recommendation is accepted."

NA.17/2.

THE KANARA CHAMBER OF COMMERCE

P. O. BOX NO. 116 MANGALORE-1 (S. INDIA)

TELEGRAMS: "CHAMBER"
TELEPHONE: 128

Date 22nd February 1956.

REGD.A.D.

The Hon'ble Raja Sri Shanmuga Rajeswara Sethupathi,
Minister for Public Works,
Government of Madras,
Fort St.George,
MADRAS.

GOVERNMENT 1503 24 FEB 1956 PUBLIC WORKS DEPARTMENT

Sir,

Sub: Development of Mangalore Port as an All-Weather Port.

***

Consequent upon the Report of the West Coast Major Port Development Committee, which could not recommend Mangalore for siting a Major Port, but recommended that certain Minor Ports should be developed as All-Weather Ports, this Chamber had presented to the Government of Madras and also the Government of India, a Memorandum on the 16th September, 1949, detailing a scheme for developing the Mangalore Port into an All-Weather Port. This matter was further considered by the then Port Conservancy Board at Mangalore and the Port Officer, Mangalore had also prepared a similar scheme for developing Mangalore as an All-Weather Port.

2. At the meeting of the Central Board of Transport, held at Madras on the 6th January 1950, it was suggested that this matter should be referred to the Central Water and Power Research Station, Poona for technical investigations by means of Model Experiments. The Chamber, in its memorandum dated the 24th July 1950 presented to the then Minister for Public Works, Madras, had pressed the urgency for referring the question of developing Mangalore as an All-Weather Port, to the Poona Research Station. The Chamber was pleased to note that this problem was finally referred to the Poona Research Station and after a detailed and exhaustive study, the said Research Station has arrived at conclusions as a result of experiments conducted by them.

3. A report on the experiments and the conclusions arrived at, has been received by the Mangalore Port Trust, who have studied the report and passed the following Resolution at their meeting held on 14-2-1956:-

> " Resolved that in view of the report of the Director, Central Water & Power Research Station, Poona, having conclusively proved that Mangalore can be developed into an All-Weather Port without any difficulty, the State Government be requested to use all its influence to move the Union Government to include the development of Mangalore into an All-Weather Port in the Second Five Year Plan. The State Government may also be requested to move the Union Government to immediately appoint a competent Harbour Engineer to prepare a lay out of the proposed Harbour at Mangalore with detailed plans and estimates so that the orders for the necessary plant etc., can be placed without any delay and the scheme pushed through during the Second Five Year Plan period. The Board is prepared to bear the cost of preparing

the lay-out plans and estimates if necessary and provide a sum of Rs.50,000/- for this purpose during 1956-57."

4. It will thus be seen that it has been conclusively proved that the Port of Mangalore can be developed as an All-Weather Port without any difficulty, and that steamers upto a draft of about 24 feet can be provided for at Mangalore Port. In this connection, it may be pointed out that a large percentage of steamers arriving at Indian Ports draw less than 24 ft.of water. The maximum draft of Indian ships built at Vishakapatnam yard is about 25 ft.and Mangalore being a way-side Port and a Port of call as against a terminal Port, steamers arriving here are generally partly loaded and invariably draw less than 24 ft.of water.

5. The Report on the Poona Experiments, does not altogether refuse to foresee the possibility of the Port being able to maintain a deeper channel even to the extent of 30 ft.draft and it may not be difficult with modern engineering methods to have a deeper channel.

6. The Report is thus quite in favour of siting an All-Weather Port which can meet all the needs for all practical purposes. The cost of construction of this Port is not expected to be excessive. Considering the heavy congestions occurring at all the Major Ports in the country and the heavy expenditure that is planned to be expended at these Major Ports, opening up of the Mangalore Port will be highly beneficial to the country and may even save much larger investments at other Ports. That apart, the Mangalore Port is now closed for sea traffic for 4 months in a year due to the South West Monsoon, when, the labour is thrown out of employment. The development of this Port as an All-Weather Port will provide continuous employment of labour throughout the year as the Port will enable ships to call throughout the year.

7. The Mangalore Port Trust Board in its resolution has rightly hastened to request the Government to take steps to implement the findings by appointing a Harbour Engineer to plan the Port and prepare estimates. It has even expressed its willingness to shoulder the burden of cost, if necessary, in spite of its resources being very limited.

We have therefore to request you to kindly take up this matter with the Union Government immediately and prevail upon them (1) to include the development of Mangalore Port as an All-Weather Port in the Second Five Year Plan and (2)to appoint a Harbour Engineer at the earliest possible time to prepare a lay-out of the proposed Harbour at Mangalore.

Thanking you,

Yours faithfully,
For THE KANARA CHAMBER OF COMMERCE.

Hon. Sec.

Copy to:-

(1) The Secretary to the Govt.of Madras, Public Works Department, Madras.
(2) Shri U.S.Malliah M.P., New Delhi.

P.W.D.(F-1).

27

LETTER No.51821 F/55-3 dt. 12.3.56

To

The Director,
Central Water & Power Research Station,
Post Box No.18,
Poona - 1.

Sir,

SUB: Mangalore Port Model - Retention.

REF: Your letter No.179/768 of 56, dt. 23.1.56 to the S.P.O. Madras.

...

I am directed to convey the sanction of the State Govt. to the retention until it is no longer required of the model of the Mangalore Port (Constructed) at your Research Station. I am to request that the balance of the deposit amount ~~that might remain outstanding~~ after retaining sufficient funds for maintenance of the model until 31.3.57 may kindly be refunded to the Chairman, Mangalore Port Trust, under intimation to the Govt.

2. I am also directed to convey the approval of the State Govt. to the shifting of the position of the ~~wave generation~~ wave generators ~~refe~~ referred ~~rred~~ to in para 2 of your letter cited.

Y.F.

CENTRAL DESPATCH BRANCH
Date 15.3.56. Initials.

A a- pp17 c.f.

pp17 and 21 c.f.

Copy to the S.P.O
" " " C.T.P.T.

13/3/56
8.3.56

8/3/56

10.3.56

NOTE: The above draft is submitted with reference to the recommendations of the S.P.O. and Chairman, Mangalore Port Trust, in ~~the~~ their references on pp.17 and 21 c.f. ~~respectively.~~

p.t.o.

25

The representation from the Kanara Chamber of Commerce on pp.23-25 c.f. may be filed as action has already been taken in the matter - vide Endt. on p. 20 c.f.

Mr S.P.O's remarks, when recd, will be treated as Spl.

Draft reply may issue.

h/ 4.3.58.

DNS 8.3.58.

8/3

Ur 10.3.58

Tel. No. : 2629
Tel. Address : CEWAPORES

GOVERNMENT OF INDIA
CENTRAL WATER & POWER RESEARCH STATION
POST BOX NO. 18, POONA

No.: 179/ 2564 of 1956, Poona, 8 MAR 1956

To

The State Port Officer,
P.B.No. 13,
Madras - 1.

ASST. SECRETARY TO GOVERNMENT
1919
12 MAR 1956
PUBLIC WORKS DEPARTMENT

Sub.:- Corrigendum -- Specific Note No. 374 of 17-12-55.

Sir,

The corrections as shown in table No.1, may kindly be carried out.

Yours faithfully,

Dy. Director,
for Director,
C.W. & P.R.Station, Poona.

Rss/7.3.

Copy with compliments to :-

1) Dy. Secretary to the Govt. of Madras, Public Works Department.

2) Port Officer, Mangalore.

All communications should be addressed to the Secretary to the Government of India, Ministry of Transport, by title, NOT by name.

Telegrams :
"TRANSPORT."

GOVERNMENT OF INDIA.

Ministry of Transport.
(Transport Wing)

No. 9-PII(51)/55.

NEW DELHI, the 13th March, 1956.

ASST. SECRETARY TO GOVERNMENT OF PUBLIC WORKS DEPARTMENT
2062
16 MAR 1956

From

Shri A.V. Subramania Iyer,
Under Secretary to the Govt. of India

To

The Secretary to the Govt. of Madras,
Public Works Department, Madras.

Subject:- Development of Mangalore port.

-.-

Sir,

I am directed to request that if the Poona Research Station has submitted its report of the results of the investigations carried out at that Station concerning the Mangalore Portt, a copy thereof may be furnished to this Ministry, together with your comments at an early date.

Yours faithfully,

(A.V. Subramania Iyer)
Under Secretary to the Govt. of India.

D.A.Nil
"BALUJA"

2 drafts

I

55

P.W.D.(F-1)

Urgent.

MEMO.No.51821 F/55-4 dt. 23.3.56

Sub: Mangalore Port Model.

Ref: Govt.Endt.No.51821 F/55.2 dated 23.2.56.

.....

The S.P.O. is requested to expedite his reply.

23/3/56.

DRS 22.3.56.

22.3.56

To The S.P.O.

CENTRAL DESPATCH BRANCH

Date 24/3. Despatcher's Initials.

II

PWD

LETTER No.51821 F/55-5 dt. 23.3

To

The Secy. to the Govt. of I
Ministry of Transport (Tran
Wi
NEW DELHI.

Sir,

Sub: Development of Mangal
Ref: Sri Subramania Iyer's
No.9-PII(51)55,dt.13.

...

I am directed to state tha
final report on the model experi
carried out at the Poona Research
has not yet been received. On
receipt and examination
will be submitted to F.M.
Govt. of India.

23/3/56

DRS 22.3.56

22.3.56

p.1

2

NOTE: Pp.29-31 may be filed.

3/21.3.80

DR 22.3.80

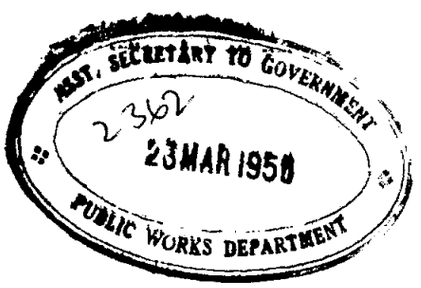
GOVERNMENT OF INDIA
CENTRAL WATER AND POWER RESEARCH STATION
POONA-1.

~~21 MAR 1956~~

No.179/2922 of 1956. 16th March 1956.

To

The Chairman,
Mangalore Port Trust,
P.B.No.146,
Mangalore 1.



Subject: Mangalore Port Model--
Refunding the balance of deposit.

Reference: Your No.111/56-1 dated
17th February, 1956.

Sir,

Kindly refer to your letter cited above. As has already been discussed with the state Port Officer the main purpose of retaining the model is to carry out any further experiments, if necessary, after the final decision regarding the development of Mangalore Port is taken.

It is not, therefore, possible to estimate at this stage what amount would exactly be necessary, as this will depend on the experiments which may be required to be carried out ~~latter~~ later. In view of this the balance of deposit would be refunded only after the completion of all the experiments.

Yours faithfully,

Sd/- D.V. Joglekar
DIRECTOR,
Central W.& P.Res.Stn.,Poona.

Copy with compliments to State Port Officer.

---oOo---

Government of India
Central Water & Power Research Station.
.....

No.179/3076 of 1956. Poona. 21/3/56

Copy f.w.cs to the Deputy Secretary to Government P.W.D.Fort St.George, Madras-9 for information with reference to his letter No.51821 F/55-3,dated 12th March'56.

Sd/-
for DIRECTOR,
Central W.& P.Res.Stn.,Poona.

YAM/ 20.3.56

Copy to C.R.C.(Navigation).

GOVERNMENT OF INDIA
CENTRAL WATER AND POWER RESEARCH STATION
POONA-1.

No.175/2522 of 1956. 15th March 1956.

To

The Chairman,
Mangalore Port Trust,
P.B. No.146,
Mangalore 1.

Subject: Mangalore Port Model--
Refunding the balance of deposit.

Reference:Your No.III/56-1 dated
17th February, 1956.

Sir,

Kindly refer to your letter cited above. As
has already been discussed with the state Port Officer
the main purpose of retaining the model is to carry out
any further experiments, if necessary, after the final
decision regarding the development of Mangalore Port is
taken.

It is not, therefore, possible to estimate
at this stage what amount would exactly be necessary,
as this will depend on the experiments which may be
required to be carried out later. In view of this
the balance of deposit would be refunded only after the
completion of all the experiments.

Yours faithfully,

DIRECTOR,
Central Water & Power Research Station,
Poona.

Copy with compliments to State Port Officer.

---o0o---

Government of India
Central Water & Power Research Station.
.....

No.175/307 dated 1956. Poona.

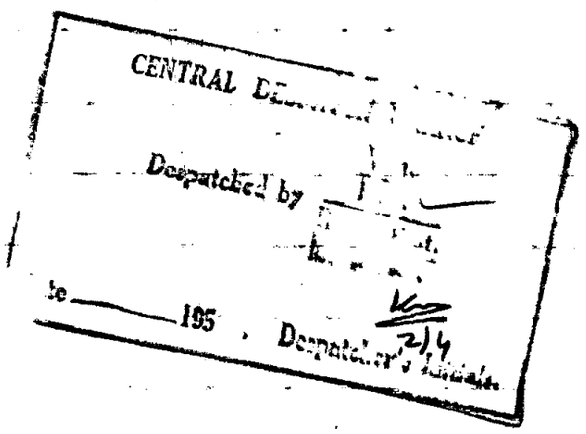
Copy forwarded to the Deputy Secretary to Government
of India,C.D.Port Section, Madras-9 for information with ref-
erence to his letter No.51621 T/55-3,dated 12th March'56.

for DIRECTOR,
Central Water & Power Research Station,
Poona.

P.W.D. (F.)

39

Letter No. 51821F/55-6 of 29-3-56.



To

The Director,
Central Water and Power
Research Station,
Post Box. No. 18,
Poona. 1.

Sir,

Sub: Mangalore Port Model
Experiments

Ref: Correspondence resting
with your endt. No. 179/3076
of 1956 of 21.2.56.

I am directed to state that the Govt. of India in the Ministry of Transport (Transport Wing) have called for a copy of the Report on the Model Experiments ~~con~~ relating to the Mangalore Port, with the comments of the State Govt. I am accordingly to request that after all the Experiments are completed, ~~2~~ two complete sets of the report may kindly be sent to this Govt. for their use ~~of the State Govt.~~ and for being forwarded to the Govt. of India.

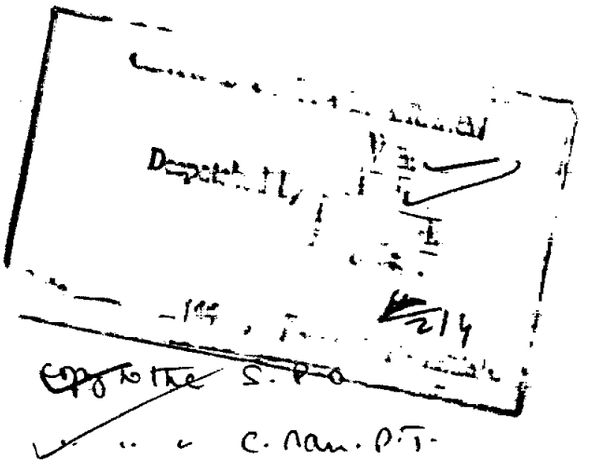
We receive

40

communication may kindly be acknowledged.

DMS
29/8/56.

29.3.56



Note:

The reference on p37 cp may be filed.

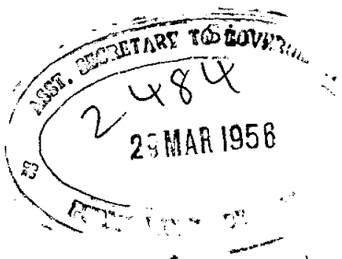
DMS
29/8/56.

29.3.56

From:
L.H.Cornish Esq.,
State Port Officer,
P.E.No.13,
Madras-1.

To:
The Secretary to Government,
Public Works Department,
Madras.

No.582 G1/56-1 dated 27th March 1956.



Mangalore Port - Development into an All Weather Port - Final note on experiments conducted at the Central Water and Power Research Station.

Government Endt. No.51821 F/55-2 P.W. [illegible] dated 23-2-1956.

--

I invite a reference to my letter to Government No. 3423 G1/55-2 dated 20-1-1956 on the above subject.

2/ In the conclusions on the final note on Mangalore Port Model Experiments, it is seen that the dredging of the approach channel for admitting ships drawing 22 feet had shown favourable results when break waters of 2000 feet in length are provided, this would permit ships drawing slightly more water to enter at H.W. times.

3/ The further dredging of the channel to maintain 30 feet, it is said would not be an economic proposition or even physically possible, therefore it would appear that although an all weather port at Mangalore for steamers drawing 22 feet is very favourable, any further development to permit deeper draft ships would be out of the question.

4/ In the above circumstances, if it is considered that the port to be developed in the West Coast should be able to accommodate all draft ships, then in view of the fact that the majority of the cargo to be exported and imported would be from and to the hinterland, I am of the opinion that the question of developing Malpe should be at least first looked into especially also in view of the recommendations of the West Coast Major Port Development Committee; otherwise if an All Weather Port to accommodate ships only upto 22 feet draft is required, Mangalore would be suitable for such a port.

5/ As regards providing a sum of Rs.50,000/- for preparing lay out plans and estimates for a harbour at Mangalore, I would suggest that Government of India's decision in the matter may be awaited.

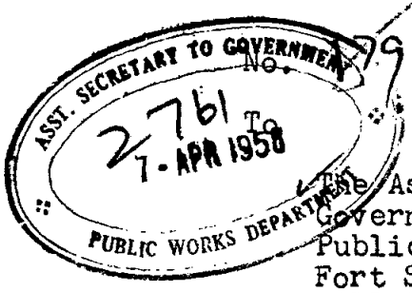
Yours faithfully,

State Port Officer.

AT/27.

Tel.No.:- 2629
Tel.Address:- CEWAPORES.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER RESEARCH STATION POONA



No. 79/3727 of 56. 5 APR 1956

To

The Assistant Secretary to
Government of Madras,
Public Works Department,
Fort St. George,
MADRAS - 9.

Sub:- Mangalore Port Model Experiments.

Sir,

This is to acknowledge receipt of your letter No.51821/F/55-6 dated the 29th March, 1956.

The model experiments in connection with development of Mangalore Port have been completed in all respects. Two more specific notes have been written and they will be sent to you soon. I do not have spare copies of the specific notes written on model experiments from time to time. I will therefore have to get them typed again. This may take some time. Two complete sets of these notes will be sent to you in due course of time.

Yours faithfully,

D. V. Joglekar

Director, CW&PRS.

P.B.K.5/4.

For A.S.
Submitted for perusal
'A' above may be awaited till 1.6.56
Action on the SPO's letter on p 41 ante
will be taken after the copies of the report
are received from the ~~Chairman~~ Director,
C.W.&P.R.S. Poona.
18.5.56

gk 5/4

17.4.56

notes will be sent to you in due course of time.

This may seem to be a time consuming set of these
specific notes written on every enquiry from you to
me. I will therefore have to get the typed slip.
Also more specific notes will be given attention and they will
be sent to you soon. I do not have more copies of the
circular letter which explained in all respects.

The model experiments in connection with development

No.SIGZI/1/33-3 dated the 15th Apr., 194..

Sir,

I have to refer to your letter

Subject - Re.

From - The Secretary to
Government of Madras,
Public Works Department,
Fort St. George.

To - The Director of Geology,
Geological Survey of India,
Calcutta.

Dated - 1-APR 1950

No. [illegible] of 194..

Sir,

I am directed to forward herewith a copy of the letter
from the Secretary to the Government of Madras, Public Works Department,
No. [illegible] dated the 15th Apr., 194..

The model experiments in connection with development

Yours faithfully,

for Director, [illegible]

ASST. SECY TO GOVERNMENT
9-MAY 1956
PUBLIC WORKS DEPARTMENT

GOVERNMENT OF INDIA
CENTRAL WATER & POWER RESEARCH STATION
POONA

No. 179/ 4742 of 1956 dated- 30-4-56

To

The State Port Officer,
MADRAS.

Specific Note No.388 of 20-4-56
on 1/250 : 1/50 Mangalore Port Model.

Sir,

I am sending herewith specific note No.388 of 20th April, 1956, describing experiments on 1/250 : 1/50 Mangalore Port Model. The note mainly covers the experiments carried out in connection with the approach channel through the sand spit. I am enclosing herewith one more copy of the note for transmitting it to the Secretary, Canara Chamber of Commerce, Mangalore.

D.O. : One note i duplicate.

Yours faithfully,

P.W.D. (F1)
Filed.
11.5.56 DMS
16.5.56.
16/5/56

D. V. Joglekar
Director, CW&PRS.

Copy of Note with
Copy with compliments to :—

1. The Chairman, Central Water & Power Commission, New Delhi.
2. The Secretary, P.W.D. Madras,
3. The Port Officer, Mangalore.

Mulay
30.4.

MC 114

PUBLIC WORKS DEPARTMENT

Memorandum No. 1897X J/55-5 dated 10th August 1956.

Sub: Irrigation - South Kanara District - Gurpur river bar - Results of model experiment.

Ref: From the Chief Engineer (Irrigation) No.5440/54 B.10 dated 26-7-56.

...

Specific note No.388 of dated 20-4-56 of the Central Water and Power Research Station, Poona, in original, is forwarded to the Chief Engineer (Irrigation) for reference and return.

2. The Chief Engineer is requested to acknowledge the receipt of the note.

D. AMALORPAVANATHAN,
Assistant Secretary to Government.

To

The Chief Engineer (Irrigation) (with specific note No.388 dated 20-4-56).

Copy to 'F' Section, Public Works Department.

Forwarded /By order/

SUPERINTENDENT.

cpsd. 11/8.

CENTRAL DE...
Post.
...r's Initials
Date

4.9

P.V.

Letter No 51821-F/55-79 &

The Director,
Central Water & Power
Research Station
Poona.

Sir,

Sub: Mangalore Port Model experiments.

Ref: Your letter No 179/3731 of 56 of 5.4.56

I am directed to ~~invite~~ ~~your attention to the~~ refer to your letter cited and to request that two complete sets of specific notes on the Mangalore port model experiments may kindly be sent to this Govt at an early date.

Yours faithfully,

(D)
25/8/56

DWS
25.8.56

DD
25/8/56

P.W.(F-1).

I

BY REGISTERED POST.

Two Drafts.

Letter No.51821-F/55-8 dated 18.10.56

To

The Secy. to the Govt. of India,
Ministry of Transport (Transport Wing), New Delhi (with encls.)

Encl:

Specific Note No.374 dated 17-12-55 (2 volumes) in original and copy of pages 9-15 of

Sir,

Sub: Ports - Mangalore - Development into all weather port

Ref: Sri Subramania Iyer's letter No.9-PII(51)/55 dated 13-3-1956.

This Government's letter No.51821-F/55-5 dated 23-3-1956.

I am directed to state that the model experiments connected with the development of Mangalore Port have been completed in all respects, and that complete sets of the four specific notes on the model experiments are awaited. ~~On receipt the~~ set of the notes will be forwarded to the Govt. of India as soon as copies are received.

2. I am to state in this connection that specific Note No.37 dated 17-12-1955 (copy already received from the Director, Central Water and Power Research Station, Poona) deals with the question of maintaining a dredged channel at the Mangalore Port

p.t.o.

5.

A copy of this specific Note as also a brief note on the Mangalore experiments received from the Director in January 1956 are enclosed for the reference of the Govt. of India. It would be observed from the conclusions arrived at in the two notes that maintenance of a channel at the Port to admit throughout the year ships having a draft varying from 21 to 24 feet would be possible, and that further dredging of the channel to admit ships of greater draft would not be an economic proposition and would also be physically impossible. It would, therefore, be possible to develop Mangalore Port into an All Weather Port for the use of ships having a draft varying between 21 and 24 feet. The Mangalore Port Trust Board have consequently requested the State Govt. to move the Govt. of India -

(i) to include the development of the Mangalore Port into an All Weather Port in the Second Five Year Plan; and

(ii) to immediately appoint a competent Harbour Engineer to prepare a lay out of the proposed harbour with detailed plans and estimates, so that orders for necessary plants etc. could be placed without any delay. The Port Trust Board is also willing to bear if necessary the cost of preparing the lay out plans and estimates, and provide a sum of Rs 50,000 for this purpose during the current year.

* (N) & (H) → pp9-15 of

para 15 on pp58-59 of (N) and 'R' & 'S' on p11 of.

Pl. see p19 of

I am directed to state that irrespective of the choice of Mangalore or Malpe for ~~the~~ development ~~of~~ a major port for the area, the model experiments have conclusively proved that there is a good case for developing Mangalore as a 24 feet All Weather Port by suitable dredging. There is also all round agitation for such development. I am accordingly directed to request that the development of the Mangalore Port into an All Weather Port for ships upto 24 feet draft may kindly be included in the Second Five Year Plan. I am also to request that a suitable Marine Engineer may kindly be deputed to prepare the layout of the proposed harbour with detailed plans and estimates.

Y.F.

Copy to the Chairman, Mangalore Port Trust, Mangalore.

Copy to the S.P.O.

Copy to Mysore Govt.

II

Letter No.51821-F/55- 9 dated 18.10.56

To

The Director,
Central Water and Power Research Station,
Poona.

Sir,

Sub: Mangalore Port Model Experiments.

Ref: Your letter No.179/3727 of 56 dated 5-4-1956.

This Government's letter No.51821-F/ 55-7 P.W. dated 25-8-1956.

I am directed to request that the two complete sets of the Specific Notes on the Mangalore Port model experiments may kindly be sent to this Government at an early date, as one set of the notes has to be forwarded to the Govt. of India for further examination.

Y.F.

MANGALORE PORT TRUST

Ref. No.

POST BOX No. **146.**

MANGALORE, 1st October, 1956

From

Sri. V. S. Kudva,
Vice Chairman,
Mangalore Port Trust,
Mangalore.

To

The Secretary,
Public Works Department,
Government of Madras,
Fort St. George, Madras.

Sir,

I refer you the interview that the Port Trust Board Delegation along with Sri. S. Narsappaya M.L.C. had with you at 12.30 noon on 27th September when you after hearing us and discussing with us the several aspects regarding forwarding of the report on this Port of the Director of the Central Water and Power Research Station, Khadakvasla, Poona to the Government of India, Dell with the endorsement of Government of Madras, promised to deal with the same within ten days. We shall be grateful if you kindly deal with it favourably and inform me of same. If any further elucidation of our case is necessary, the undersigned will be very pleased to call on you again. Our M.P. Sri. K. Sadanand Hegde has promised me to see you on this subject about the 8th or 9th of this month.

Yours faithfully

(V. S. Kudva)
VICE- CHAIRMAN.

vsk/mbs

P.W.D.(F.)

The main file (C.No 51821-F/55) is under circulation to M(W) and ~~M(H)~~. This may, therefore, lie over till the return of the main file.

2/6/10/56 — 7/8/10/56 — 6.10.56

P.W.D (F.)

Recommendations for the development of Mangalore into an all weather port have already been made to the Govt of India in the Rly at 51-53 and that a copy thereof has been sent to the C.Man. P.T. In the above circumstances no action seems called for on the above letter. May, therefore, be filed.

2/24/10/56 — 25/10/56 — DS/WM.

Specific Note No. 588 of 20-4-1956

on $\frac{1}{250}$: $\frac{1}{50}$ MANGALORE PORT MODEL.

Experiments carried out in connection with the approach channel through the sand spit.

1. INTRODUCTION :

Experiments carried out in connection with the proposal of an approach channel through the existing entrance were discussed in Specific Note No. 574 of 17th December, 1955.

In this note, the experiments carried out regarding the proposal of an approach channel through the sand spit, with and without the diversion of the Gurpur river have been discussed.

2. NATURAL FORCES AT PLAY :

Hydrographs for the year 1952, 1953, 1954 and 1955 for the Netravati and Gurpur Rivers have been analysed. They show that discharge more than 25,000 cusecs is obtained for nil, 11, 7, and nil days respectively in the Gurpur river. It has been already mentioned in the Specific Note 574 that the tidal influx in the Netravati and Gurpur rivers are 12,200 and 4,800 acre ft. respectively and that the corresponding tidal discharge at the gut for spring tide is 47,000 cusecs. With the opening of the Gurpur river through the sand spit the tidal discharge through the new opening would be about 15,000 cusecs. For maintaining the approach channel throughout the year to admit ships drawing 22 ft., area of cross section of 20,000 sq.ft. below mid tide is required. To move the material on the bed of the channel a minimum bed velocity of 1 feet per second is necessary for the size of the particles met at Mangalore. Velocity observations carried out in the prototype at the gut show that this velocity can be obtained only when the average velocity is about 2 ft/sec. This means that there must be a minimum discharge of 40,000 cusecs through the approach channel to get movement of bed material.

In the case of approach channel through the existing gut, discharge of 40,000 cusecs would be obtained even during dry season except for neap tides. In the proposal through the sand spit however, it would hardly be possible even to get this discharge during the monsoon. This

thus clearly shows that the present discharge would not be much helpful in flushing the approach channel and in combating the wave action. The effect of flushing is further lost as the available river energy is reduced due to sudden turning of the river through the sand spit. Thus the behaviour of the channel would be dominated and controlled by waves. In the proposal of isolating both the Netravati and Gurpur rivers and making inner harbour as a lagoon the flushing would be totally absent and the waves force will become still more predominant.

The effect of one more natural force to be considered is that of coastal currents which are set up in the Arabian Sea due to seasonal alterations of atmospheric pressure and also temperature differences at the head of the Arabian Sea. From February to September, these currents are from North to South and from November to January, they are from South to North. These are mainly surface currents. In the 'West Coast of India Pilot', it is mentioned that these surface currents at times reach a strength of 2 knots. Some observations were carried out up to 50 ft. depth in the sea at Cochin and these show that the strength of the currents seldom exceeds 0.5 knot. It may be emphasised here that these being mainly surface currents may not affect the bed movement which may take place due to waves up to 50 ft. depth. As already mentioned the waves veer from West-South-West to West-North-West during the Monsoon. The coastal currents may accentuate the surface currents created by waves, depending on the duration and direction of the waves. It is, however, considered that these currents may not substantially affect the bed and therefore the silting conditions of the approach channel, caused by movement of sand on the bed.

5. EXPERIMENTS WITH NEW OPENING :

The general procedure for these experiments was the same as adopted in the previous experiments with a difference that the bed load of the Gurpur was injected near the new opening of the Gurpur for the siltation studies of the channel.

In the first experiment, the Gurpur river was opened near Sultan's Battery with the diversion bund for the Netravati as shown in Fig. 1.

Fig.1

The width .. cont'd ..

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The width of the opening was designed for a discharge of 1,10,000 cusecs the ever maximum expected in the Gurpur river according to Inglis Formula. Using Lacey relation, this worked out to 830 ft. The width of 5 ft.= 750 ft. at L.W.O.S.T. was actually provided in the model. The area of cross-section of 4,000 sq.ft. below L.W.O.S.T. was provided, based on the relation of the area of cross-section and the tidal influx in the new set of conditions. Some tests were also done to determine this area experimentally. In these tests area more than 4,000 sq.ft. below low water was provided and it was observed that the area which could be obtained was near about 4,000 sq.ft.

Fig.1 shows the lines of flow for discharge of 50,000 cusecs in the Gurpur. The flow somewhat concentrates on the south edge of the new opening and after leaving the opening it spreads out (vide - photo 3559/55)

Photo 3559/55

The experiment carried out under the monsoon conditions showed that the bed load of the river is carried up to about 24 ft. contour. Fig.2 shows the contours before and after the experiment from which it will be seen that 12 ft. and 18 ft. contours opposite the opening have shifted towards west after the completion of the test. 24 ft. contour has also slightly shifted in the same way. Photo 3684/55 shows the conditions near the opening with monsoon waves. This showed a tendency to form a lunate type bar at the entrance. H.F.L. at Malavuru for a discharge of 50,000 cusecs was lowered by 5 ft. with the new opening. This may help to prevent inundation of some paddy fields.

Fig.2

Photo 3684/55

4. EXPERIMENTS FOR 30 FT. APPROACH CHANNEL :

In this experiment the entrance channel was initially dredged to 30 ft. below low water ordinary spring tide (L.W.O.S.T.) with the basin as shown in Fig.3 and photo 3705/55; the channel was aligned in conformity with the flow lines obtained with the new opening. Other dimensions and particulars of the channel were the same as in the previous proposal.

Fig.3 Photo 3705/55

It has been already mentioned above that the wave action will be predominant in this proposal. Naturally the breakwaters are essential in this proposal to keep out the material which may be brought [illegible] channel due to wave action, especially when [illegible]

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monsoon discharge through approach channel are too small to [redacted] out any material which may be brought by the waves, and which may have tendency to close the approach channel. As in the previous proposal for 30 ft. channel, 4,000 ft. long breakwaters were provided to get a comparative idea of both the proposals, viz. approach through the existing gut and approach channel through the sand spit. Fig. 5 shows the lines of flow with this proposal. As before silt was collected from various compartments, which are shown in Fig.4. It will be seen from Table No.1 that about 62% of the silting took place in compartments 'e' and 'f'. Sand equivalent to 5 million cu.ft. was injected at the mouth of the river (this has been theoretically estimated as shown in Specific Note No.574.) As the bed velocities in the approach channel were about 1.3 ft. per second, most of the material which would be brought by the Gurpur River would depsoit in the basin and compartment 'd'. Table 1 shows the actual quantity of silt collected from various compartments. It will be observed from this table that the material collected from Compartment 'd' was equivalent to 4.75 million cu.ft., that is more than what is brought by the river. It was noticed during the course of experiments that the portion uncovered by the breakwater gets filled up due to sand brought by wave action. This material was progressively pushed in by wave action. The total quantity collected from the channel was equivalent to 12.75 million cu.ft. Silting to the extent of 16 ft. took place in the portion outside breakwaters. This means that a depth of only 20 ft. would be available when the channel is dredged to 36 ft. As dredging can be done only in the months of January and February when favourable condition prevails, it is quite clear that it would not be possible to maintain a 30 ft. channel. If the ships are to be admitted in the channel at any time of the year, the channel may have to be initially dredged to 45 ft. allowing for silting, squatting and swelling. Such a channel would be considerably longer and with the length the difficulties of maintaining a channel would be enormous.

Fig.# 4
Table No.1

It may be mentioned here that breakwaters of 4,000 ft. length only was tested in the model. It has been stated above that as the wave action is predominant in this case, the outer channel not covered by [redacted]

— Contd —

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breakwater would start silting up immediately during the monsoon. If the breakwater length is extended to 30 ft. contour, the material on the bed of the sea, which is in movement for the normal wave action during the monsoon would not be brought into the channel. Though the silting would be reduced with the extended breakwaters, the cost of such a breakwater would be very high because as every foot the breakwater is taken into deep water, larger size of blocks will have to be used to withstand the action of waves and larger the section becomes. Even with 4,000 ft.length breakwaters, it was observed that the silting which would take place on the North and South side (particularly on the South side) of the breakwaters would block up the mouth of the Netravati river and the regime of this river would then change considerably. Another important point which is also to be taken into consideration is what would happen to the silting in the outer channel when the coast is built up to the end of the breakwater. Of course, this may take some years, but the conditions of the channel under these circumstances have also to be visualised now. Generally, it is observed that with such breakwaters, contours advance and the tendency of re-establishing the old equilibrium conditions is noticed. This has happened in the case of French harbours at Dunkirk and Calais. The breakwater length had to be then considerably increased from time to time to reduce the silting in the approach channel. A question would then be asked : " would similar tendency not be observed in the case of the approach channel through the existing gut?" As the influx through the approach channel in this case would be sufficiently high to maintain at least 20,000 sq.ft. of area below mid-tide level, the encroachment of contours on the approach channel is not expected to be as rapid and detrimental as it would be in the proposal of approach channel through the sand spit.

It has been also mentioned above that with 4,000 ft. length of breakwater, the channel outside the breakwater would give a depth of only 20 ft. below low water immediately after the Monsoon. It must be remembered that immediately after monsoon, there is some wave action and if the channel is to be dredged either during the Monsoon or immediately after the Monsoon sea-worthy Hopper Dredger can be used instead of the Pipeline Suction

course, there is a possibility of using such a type

of dredger .. contd ..

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of dredger, but the main question which would then have to be faced would be not only the capital cost but also the dredging cost of such a dredger. The capital cost of sea-worthy Hopper Dredger would be about 4 to 5 times that of the Pipeline Suction Dredger, even assuming the capacity of the sea-worthy Hopper Dredger half that of the Pipeline Suction Dredger. The dredging cost would also be normally 3 to 4 times higher in case of sea-worthy Hopper Dredger. Another important point which may be borne in mind is that the minimum draft of the sea going Hopper Dredger would be about 12 ft. under loaded conditions, even for 700 c.yds. hopper capacity. This limits the possibilities of dumping the material where required. For instance, if after the development of the Port it is observed that the shore north or south of the channel is subjected to erosion, it would then be necessary to dump the material very close to the shore on the eroding side to establish the material energy balance on that side. With the sea-worthy Hopper Dredger, the material may have to be dumped in deeper water where, naturally, the movement of bed material is not as rapid as that in the shallow water.

In some of the harbours in U.S.A. it was observed that with a sea-worthy Hopper Dredger, the material had to be dumped in about 30 ft. depth of water, and, naturally, the harbour authorities there could not establish the material energy balance and prevent the erosion of the coast.

Fig.5 Figure 5 shows the contours as laid according to the Ranson's survey, contours as obtained with channel dredged to 36 ft. without breakwaters, and contours as obtained with the channel and with breakwaters. From this, it will be seen that the coast line will build up on the south side when the waves are from West South West direction, i.e. when the predominant littoral drift would be from south to north. The rate of building of sea bed was considerably higher at the mouth of the isolated Netravati River. Such large changes at the mouth of the Netravati River would set new conditions which, however, cannot be shown by the model due to model limitations. In addition to above, the length of the channel up to 36 ft. contour would be 12,000 ft. in the case of sand spit channel proposal, whereas it would be only 9,000 ft. in the gut-channel proposal.

.. contd ..

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Analysis of the wave data has amply indicated that waves veer round from West south west to north west during the monsoon. This is an advantageous feature so far as coastal changes are concerned. But regarding silting of the channel, this feature would not be helpful in reducing the silting. The effect, however, would be cumulative because the channel itself would act as a trap and would not allow the material to move across it till equilibrium conditions are established.

The next question of dispensing with breakwaters by providing sand traps on both the sides of the approach channels was also examined. In this connection, comparison between conditions prevailing at Vizagapattam and Mangalore was done in the Specific Note No. 374. To recapitulate, the slope of the sea bed at Mangalore is much flatter than at Vizagapattam. 50 ft. contour, therefore, is quite away from the coast. Generally, with waves 10 ft. high, the bed up to 30 ft. contour will be disturbed for to the size of sand at Mangalore. This means that a sand trap up to 6,000 ft. length will be required, if this sand is to be effectively trapped. Another important point which should be noticed in this connection is the nature of the material on the bed of the sea at Mangalore. (This - material, being very fine silt and clay beyond 18 ft. contour, may not - get caught in the trap but may find way into the approach channel and then deposit in it).

Another experiment was done with artificial silting on the south side of the breakwater. Artificial silting was done in wedge shape as

Fig.6 shown in Fig.6. It is estimated that with 4,000 ft. long breakwaters, silting may take place against the breakwaters in about 25 to 30 years depending on the strength of littoral drift (this life is estimated assuming the littoral drift of 0.1 million cu.ft. from South to North.) It was observed that silting in the approach channel outside the breakwater increased from 8 M.Cft. to 9 million cu.ft. (compartments 'e' + 'f').

This proposal may also be compared with the previous proposal

Table 2. in the channel through the existing gut (vide table 2). The total quantity of silting in the approach channel observed was 20 million cu.ft. with the rivers flowing through the gut; whereas in this proposal,

.. contd ..

it is only 15 million cu.ft., and 15.87 million cu.ft. before and after the stabilisation of the coast respectively.

While comparing these two proposals it should be remembered that though the latter prima facie gives less quantity of silting, the silting was not uniform in this proposal. In the former more silting took place even with the breakwaters, because of the deposition of the load brought down by the two rivers, whereas in the latter case more silting took place outside the breakwater, limiting the depths to only 20af 20 ft. below low water. This means that there is nothing to choose between the two proposals. The latter may, however, be worse than the former as it may be possible sometimes to dredge the materials within breakwaters, as this portion will be relatively free from swell action.

This experiment shows that it would not be possible to maintain a 30 ft. deep channel throughout the year. The proposal, therefore, was considered unsatisfactory.

5. EXPERIMENT FOR 22 FT. CHANNEL :

The channel was initially dredged to 25.5 ft. below L.W.O.S.T. with a breakwater 2,000 ft. long that is same as in the case of channel through the existing gut, so as to get comparative idea of both the proposals. It was, however, observed that the swell within breakwater was considerable. The swell inside the portion covered by breakwater was as much as 7 to 8 ft., for a generated height of 10 ft. The channel was, therefore, dredged to 27 ft. so as to allow for this excess swell (see Fig.No.7). Length of the channel was 6,000 ft. and width and slope were same as before. The model test showed that silting to the extent of 8.75 million cu.ft. would take place in the pr approach channel. Out of the total quantity of the silting in the approach channel 71.5% was deposited in the portion outside the breakwater, i.e. compartments 'e' an to 'f'. 2.5 million cu.ft. silting took place in compartment 'd'. The length of the breakwater was then increased to 3,000 ft. to see if there would be any further reduction in the total quantity of silting. As in the previous experiments it was observed that silting first started taking place in the portion outside the breakwater and this silting was pushed in the approach channel by the action of waves. The total quantity of

Fig.7

.. silting .. contd ..

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silting was about the same as obtained with 2,000 ft. long breakwaters. It may be mentioned here that in the ~~prlp~~ proposal of approach channel through the existing gut, the total quantity of silting was equivalent to 4 million cu.ft. and the depth of silting was about 4 ft. This was more or less uniformly distributed throughout the channel. In the channel through the sand spit, however, the maximum depth of silting was about 7 ft. and the allowance for swell required would also be more. Further it may be mentioned that the total quantity of dredging in the latter proposal would be 10.75 million cu.ft. against total 14.5 million cu.ft. from the approach channel through the existing gut. Thus, there will be excess dredging from the inner harbour in the former proposal but it may be emphasised here that the question of maintenance of outer channel is more important than the inner harbour as dredging can be done throughout the whole year in the inner harbour. This cannot be so in case of outer channel as the period of dredging is limited to a month or so in January or February. As already mentioned above, it may be possible to use a sea-worthy Hopper Dredger to cope up with this silting. But this would be expensive in capital and dredging cost. The important question that arises is what would happen to the channel in the years to come. It appears that wave action being predominant the waves will try to restore the original natural equilibrium conditions, i.e. silting will take place either on the south or on the north side of the breakwaters depending on the strength and direction of the littoral drift. This silting may take some years before it encroaches on the approach channel, but once this happens the waves will swamp the approach channel with the material disturbed from sea bed by the wave action. As the tidal influx in this proposal becomes very small, it would not be able to combat with this natural force of waves. In that case, if the approach channel is to be kept free and alive from heavy maintenance dredging, it would become necessary to extend breakwaters at a later stage. The model experiments have also shown a tendency to form a lunate type bar at the entrance of the approach channel. This means that even if the channel is dredged during January, from March to May there will be again a tendency to a considerable reduction of the depth in the

.. approach .. contd ..

approach channel especially when the sea is very rough sometime even in April or May. Besides, this proposal will alter the natural regime conditions of the coast and the rivers. It is obviously desirable to maintain the present regime of the coast and the rivers as much as possible. Considerable disturbances inside the approach channel and inner harbour were also observed with this proposal owing to the predominance of swell. From these considerations, even the proposal of 22 ft. channel through the sand spit was not considered satisfactory.

6. EXPERIMENTS FOR 15 FT. CHANNEL :

Owing to the necessity of a greater allowance of swell in this proposal, the channel was initially dredged to 20 ft. below L.W.O.S.T.; the length of the channel being 2,000 ft., breakwaters 1,000 ft. long were

Fig.8 constructed. Fig. 8 shows the contours before the experiments and after the experiments of approach channel and the breakwaters. From this it will be clearly seen that there was a tendency of the formation of bar at the entrance, the 18 ft. and 24 ft. contours were pushed outside. With a view to counteract this tendency of formation of shallow depths at the entrance

Fig.9 of the channel, two inclined breakwaters, as shown in figure 9 were tested. They were, however, not found effective in eliminating this trouble. This proposal does not even compare favourably with the approach channel through the existing gut, in the latter case no silting was observed. There was no such tendency of a bar to form outside the channel and there was no disturbance of wave action either in the portion between the breakwaters or in the basin. From all these considerations, a 15 ft. channel through existing gut would be better.

7. APPROACH CHANNEL THROUGH THE SAND SPIT WITH DIVERSION OF GURPUR.

In this proposal, the approach channel was dredged through the sand-

Fig.10 spit and the Gurpur river was diverted on the north side as shown in Fig.10
Photo no. and photo 145/56. The total silting in the approach channel compared with
145/56. the identical case when the Gurpur was flowing through the channel was

Table No.1 slightly more. (vide Table.No.1) . The disturbance due to waves

.. contd ..

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within the breakwaters and the harbour basin was also more compared with the previous proposal. There was no silting in the basin. The bed load of the Gurpur that would deposit outside would ∮ affect the silting of the channel due to the waves from N.W.direction in addition to the normal sand drift.

For a discharge equivalent to 50,000 cusecs, the H.F.L. at Malavuru would be lowered by 5 ft. 6 inches/ with this diversion.

This proposal was in no way better than the proposal of a channel through the sand spit with Gurpur River flowing through the channel and was not considered satisfactory.

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- TABLE NO.1 -

S. No.	Experiment.	Silt collected in basin in M.Cft. COMPARTMENTS. a	b	c	total	Silt collected from approach channel COMPARTMENTS. d	e	f	total	Total Basin + channel.	Remarks.
1.	36 ft.channel through sand spit & 4,000 ft.long breakwater.	-	-	2.25 ~~3.35~~	2.25	4.75	4.6	3.5	12.75	15.0	
2.	36 ft.channel and assumed stable coast on the south side of breakwater	-	-	2.37	2.37	4.5	5.0	4.0	13.5	15.87	
3.	27 ft. channel, 2,000 ft. long breakwater.	-	-	2.0	2.0	2.5	3.5 ~~4.~~	2.75	8.75	10.75	
4.	27 ft. channel, 3,000 ft. long breakwater.	-	-	2.25	2.25	2.25	3.6	2.6	8.45	10.70	
5.	20 ft. channel, 1,000 ft. long breakwater.	-	-	1.75	1.75	0.7	0.5	-	1.2	2.95	
6.	20 ft. channel, 1,000 ft. long breakwater and diversion of Gurpur river.	-	-	-	-	1.1	1.5	-	2.6	2.6	
7	27 ft. channel 3,000 ft. long breakwater and diversion of Gurpur.	-	-	-	-	1.5	4.0	4.3	9.8	9.8	
8	36 ft. channel, 4,000 ft. long breakwater and diversion of Gurpur	-	-	-	-	5.0	4.1	2.4	11.5 ~~2.4~~	11.5	

T A B L E : 2.

Table comparing silting in the basin and the Channel with the 'Gut-channel' and 'Sandspit-Channel' proposals.

Proposal of // Gut Channel					Proposal of Sand spit Channel.				
Particulars of the proposal	Silting in the basin M.cft.	Silting in the channel M.cft.	Total silting M.cft	Remarks	Particulars of the proposal. M.Cft.	Silting in the basin M.cft.	Silting in the channel M.cft.	Total silting M.cft.	Remarks.
50 ft. channel proposal, both rivers flowing, basin in the Gurpur & sand trap across the Netravati, 4,000 ft. breakwater.	8.5 in the basin + 8.3 in the sand trap = 16.8	20.0	36.8	Proposal 1(c)	50 ft. channel proposal and basin in the Gurpur, 4,000 ft. breakwater.	2.25	12.75	15.0	Most of the silting from the channel was outside the breakwaters.
22 ft. channel proposal, both rivers flowing and a sand trap across the Netravati 2,000 ft. break water.	5.5 in the basin + 5.1 in the sand trap = 10.6	4.0	14.6	Proposal 1(c)	22 ft. channel proposal and the basin in the Gurpur 2,000 ft. breakwater.	2.0	8.75	10.75	Most of the silting from the channel was outside the breakwaters.

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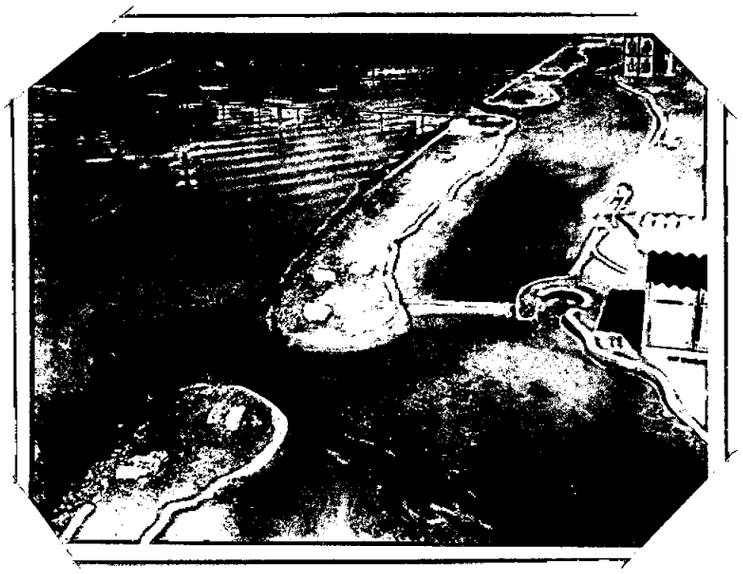

Photo No.3682/55

Showing the old mouth of the rivers, the new opening of the Gurpur and the bund.

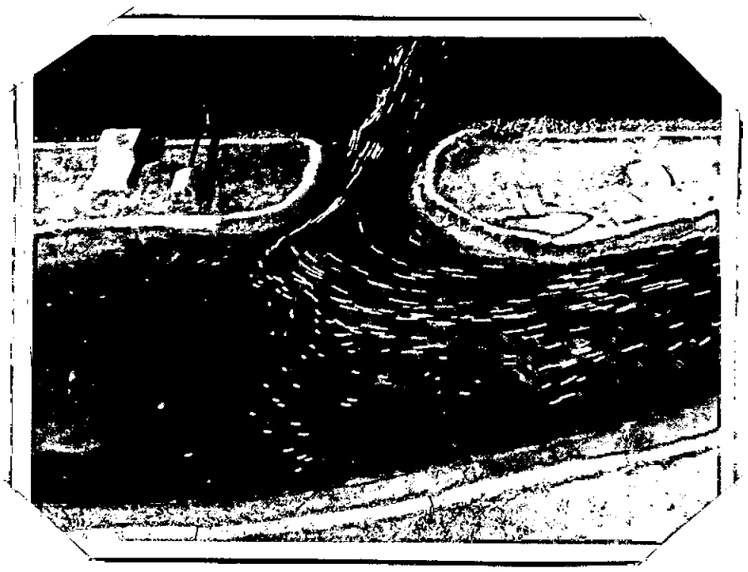

Photo No.3559/55.

Showing lines of flow at the new opening of the Gurpur, Q = 50,000 cs.

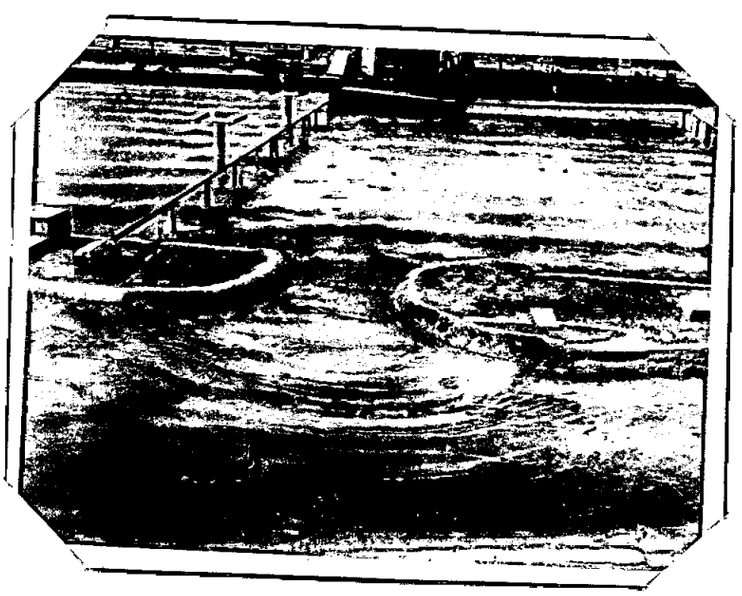

Photo No.3684/55.

Showing conditions near the new mouth of Gurpur under monsoon waves.

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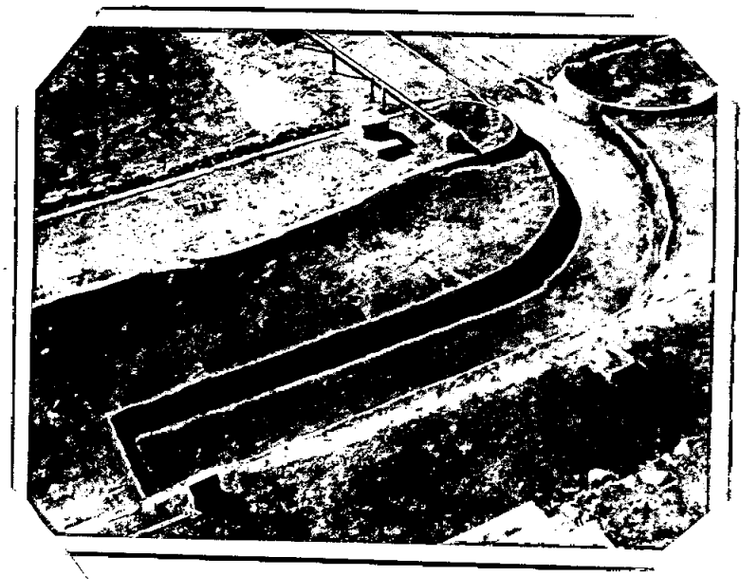


Photo No.5705/55.

Showing approach channel excavated near the new opening of the Gurpur river and the harbour basin.

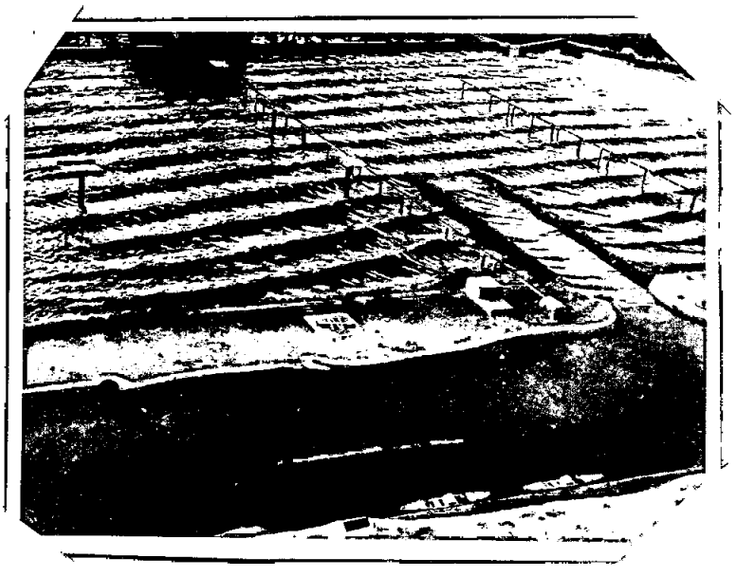


Photo No.167/56.

Showing the approach channel through the new opening of the Gurpur, breakwaters, harbour basin and monsoon waves.

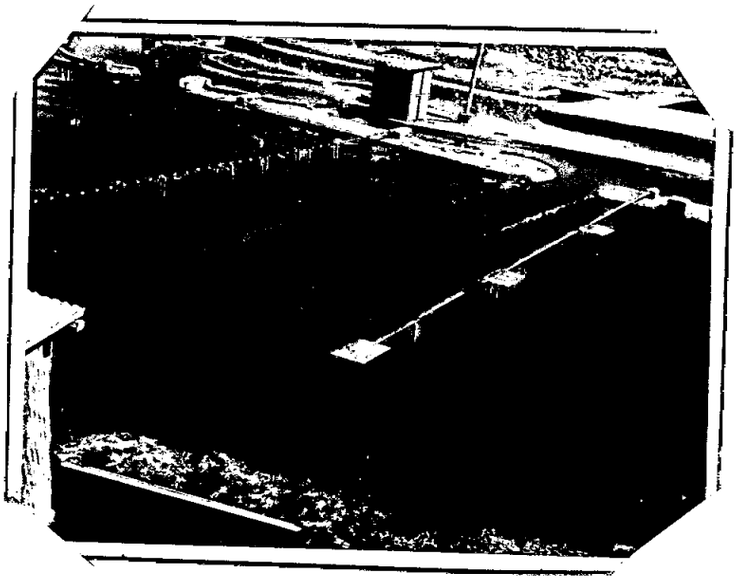


Photo no.145/56.

Showing approach channel excavated through sand spit, lagoon type harbour basin, diversion of the Gurpur, north of Sultan's Battery.

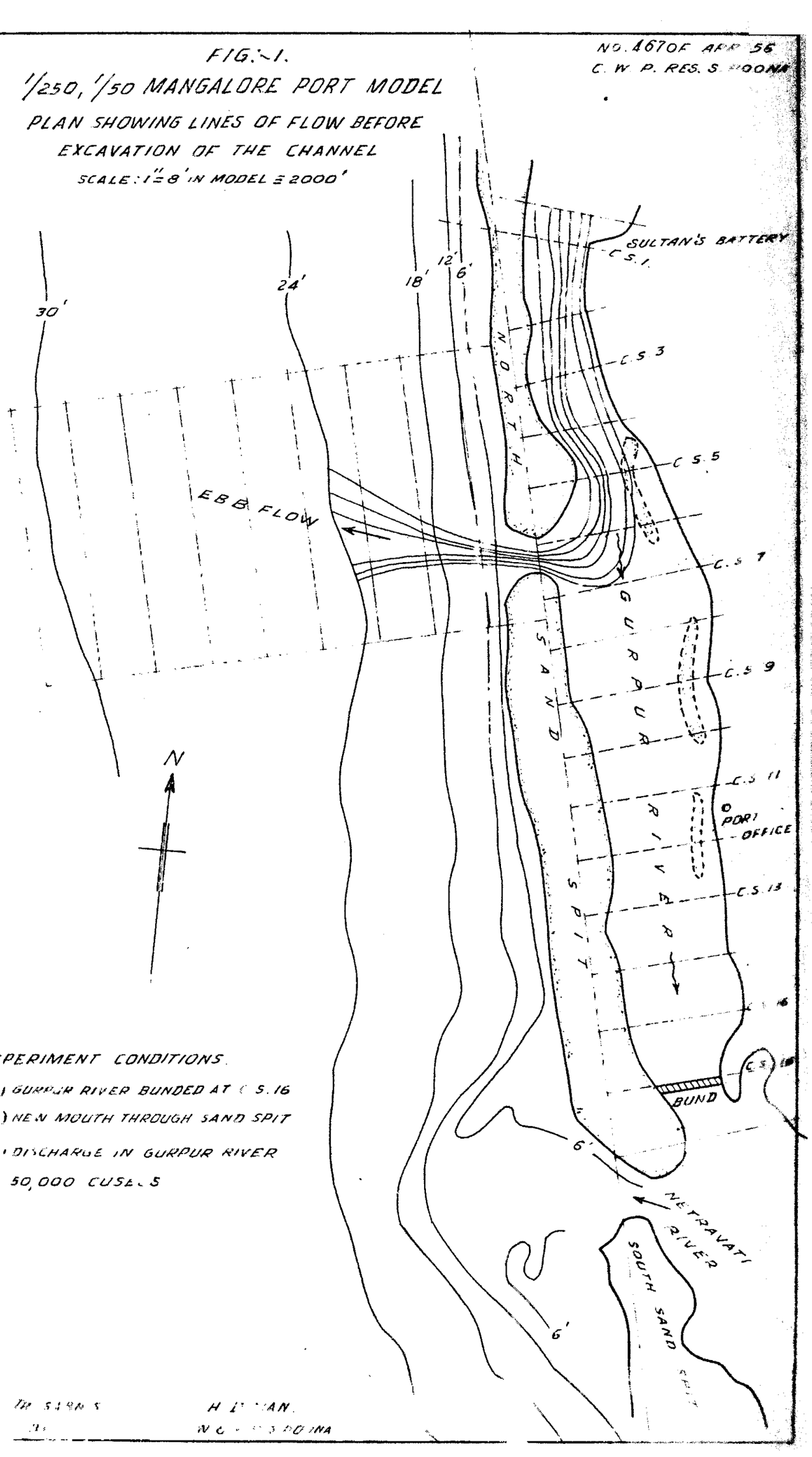
NO. 467 OF APR 56
C. W. P. RES. S. POONA

FIG. - 1.

1/250, 1/50 MANGALORE PORT MODEL

PLAN SHOWING LINES OF FLOW BEFORE EXCAVATION OF THE CHANNEL

SCALE: 1" = 8' IN MODEL = 2000'



EXPERIMENT CONDITIONS.

(1) GURPUR RIVER BUNDED AT C.S. 16

(2) NEW MOUTH THROUGH SAND SPIT

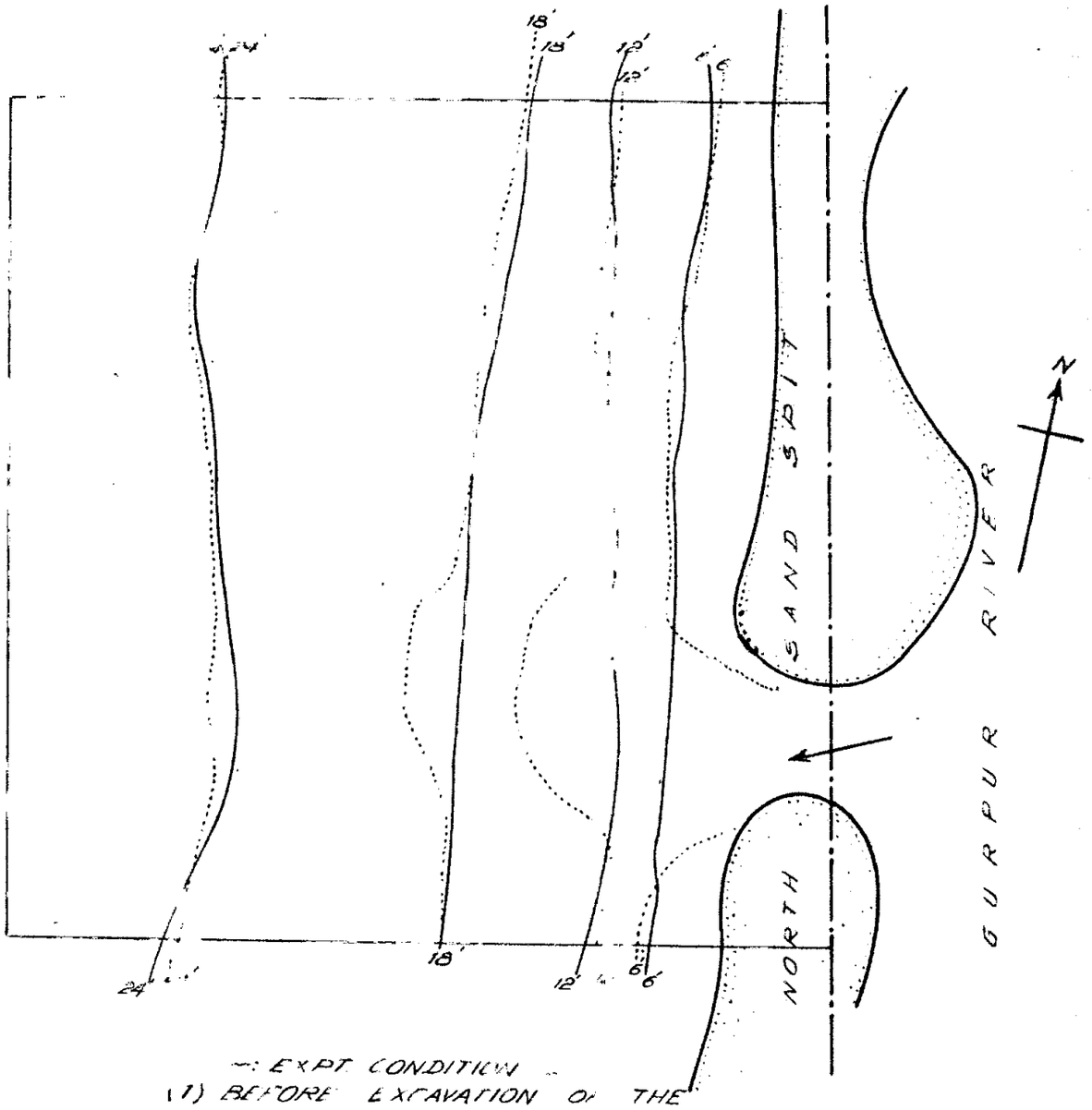
(3) DISCHARGE IN GURPUR RIVER

50,000 CUSECS

DESIGNED BY H. L. KHAN.

DRAWN BY

CHECKED BY



EXPT CONDITION
(1) BEFORE EXCAVATION OF THE APPROACH CHANNEL.
(2) EXPT WITH WAVES AND TIDES

REFERENCES:
CONTOURS BEFORE THE EXPT
CONTOURS AFTER THE EXPT

FIG: 2

1/250 : 1/50 MANGALORE PORT MODEL.
PLAN SHOWING CONTOURS BEFORE AND AFTER EXPERIMENTS.
SCALE: 1" 1000'

M. KAUT S.A.
H. D. MAN.
C.W.&P.R. STN POONA

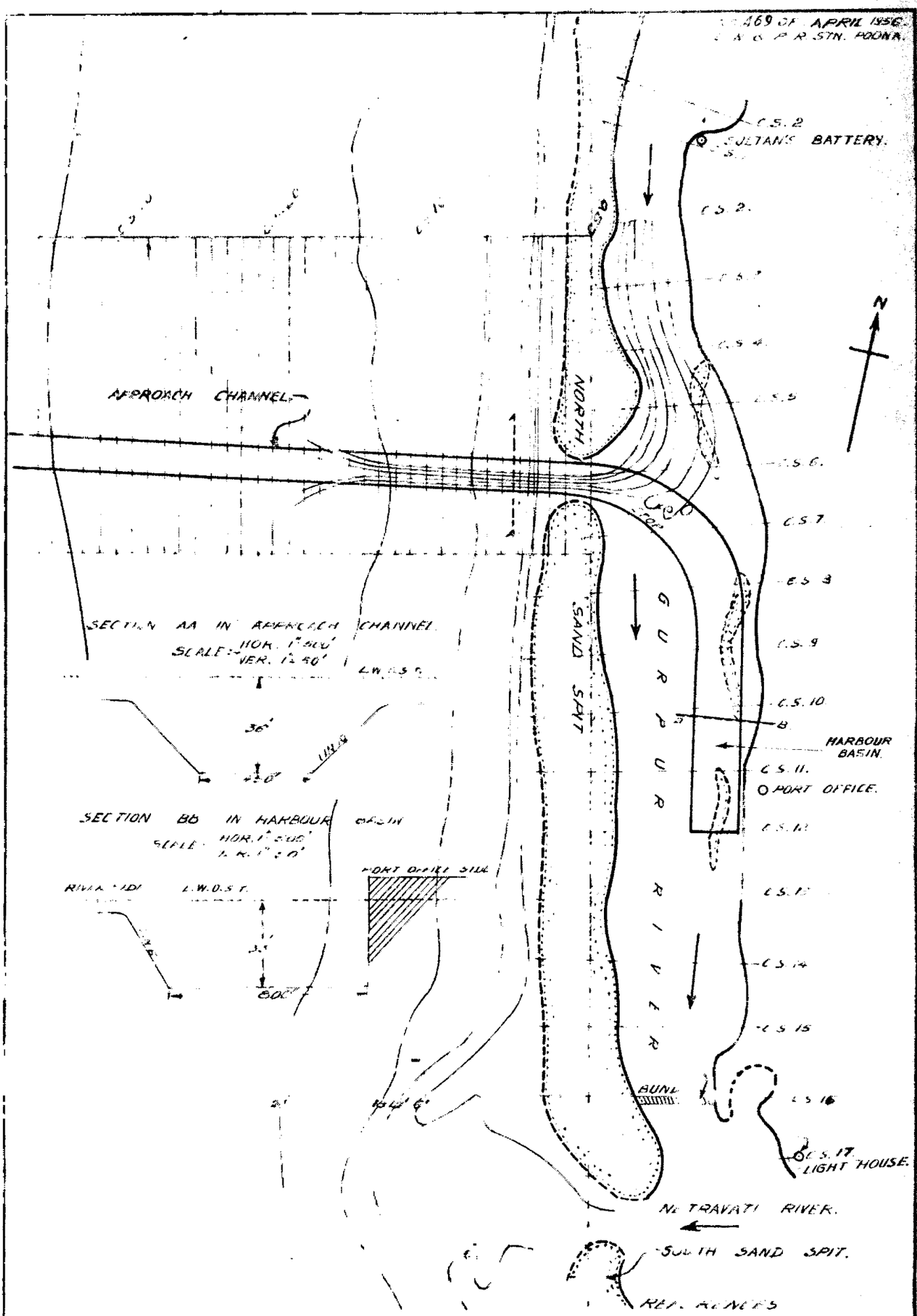


FIG.

1/250 MANGALORE PORT MODEL.

PLAN SHOWING LINES OF FLOW OBSERVATIONS IN THE GURPUR RIVER & PROPOSAL OF APPROACH CHANNEL & THE NORTH SAND SPIT.

SCALE 1"=400'

H.D.MAN

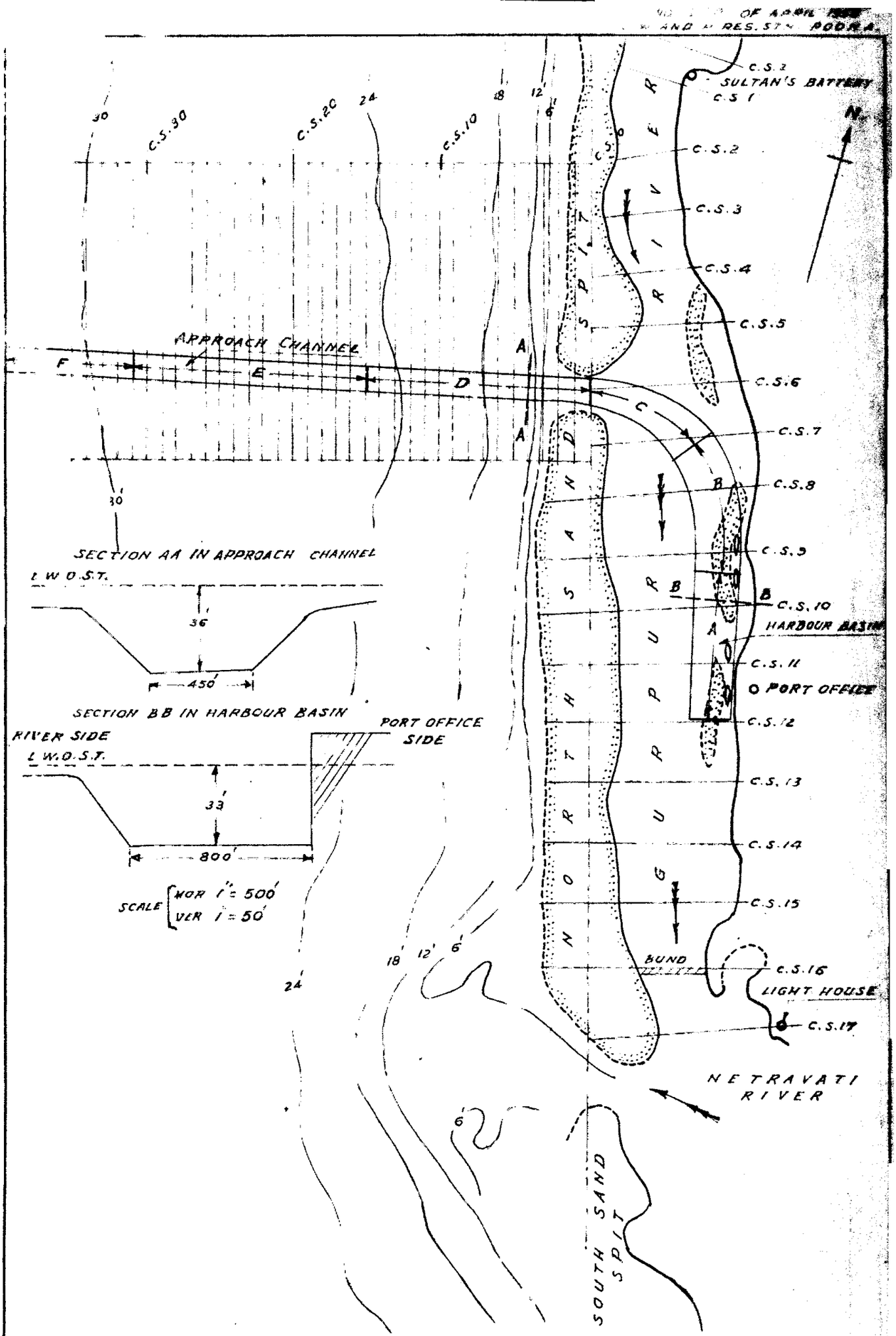


FIG. 4

1/250 : 1/50 MANGALORE PORT MODEL

SCALE 1" = 2,000'

PLAN SHOWING THE COMPARTMENTS IN BASIN AND APPROACH CHANNEL

(1) PROPOSAL OF A CHANNEL THROUGH SAND SPIT

(2) APPROACH CHANNEL DREDGED TO -33 ft

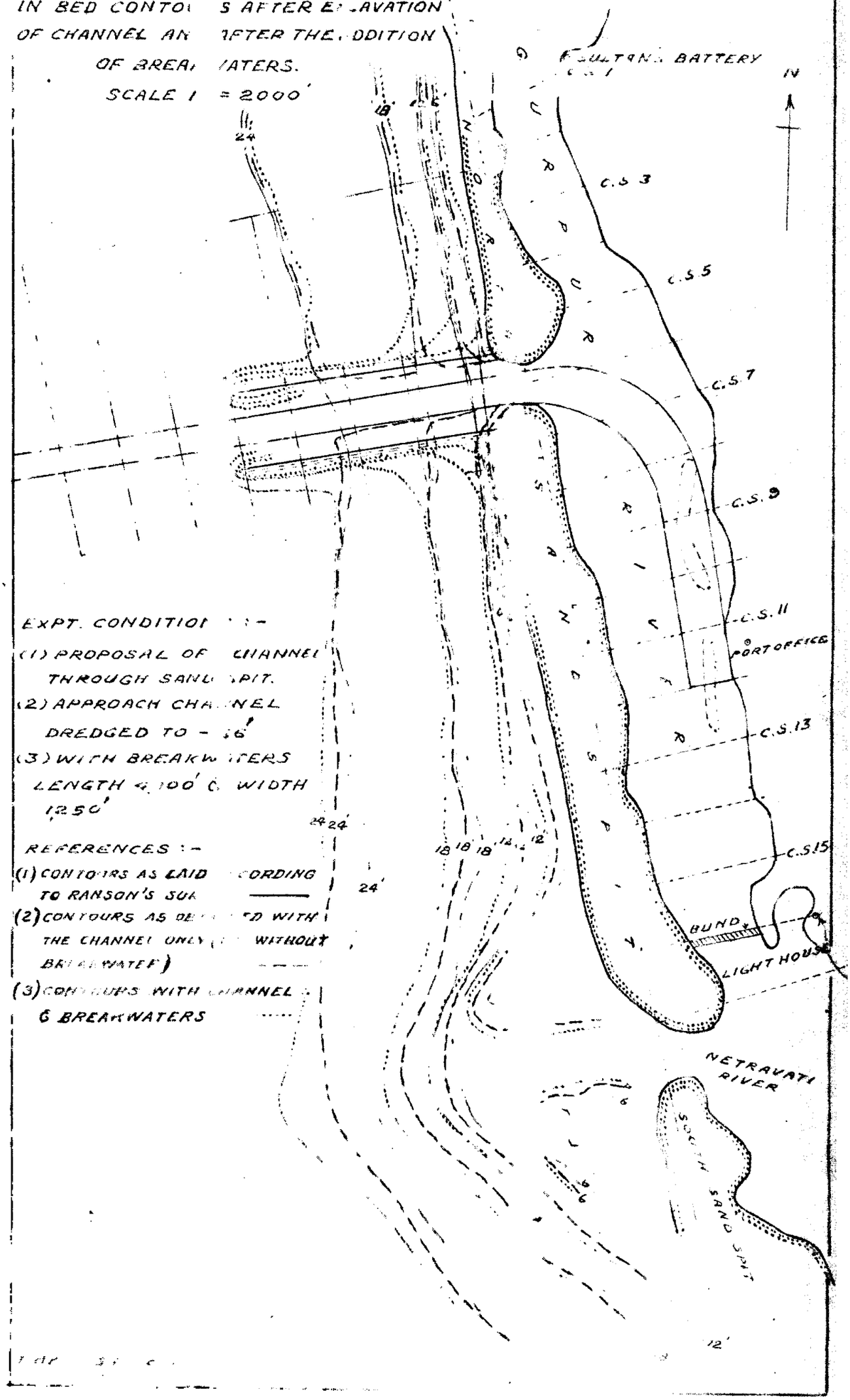
TRACED BY [illegible]

COMPD BY

A. D'MAN
C.W.&P.R.S. POONA

..S
...AD 1/50 MANGA... PORT ...DEL.

PLAN SHOWI... ALTERAT... NS
IN BED CONTO... S AFTER E...AVATION
OF CHANNEL AN... AFTER THE...DDITION
OF BREA... /ATERS.
SCALE 1 = 2000'



EXPT. CONDITIO... :-
(1) PROPOSAL OF ...HANNEL THROUGH SAND ...SPIT.
(2) APPROACH CHA...NEL DREDGED TO - ...6'
(3) WITH BREAKW...TERS LENGTH 4,100' & WIDTH 1,250'

REFERENCES :-
(1) CONTOURS AS LAID ...CORDING TO RANSON'S SUR...
(2) CONTOURS AS DE...TED WITH THE CHANNEL ONLY (... WITHOUT BREAKWATER)
(3) CONTOURS WITH CHANNEL & BREAKWATERS

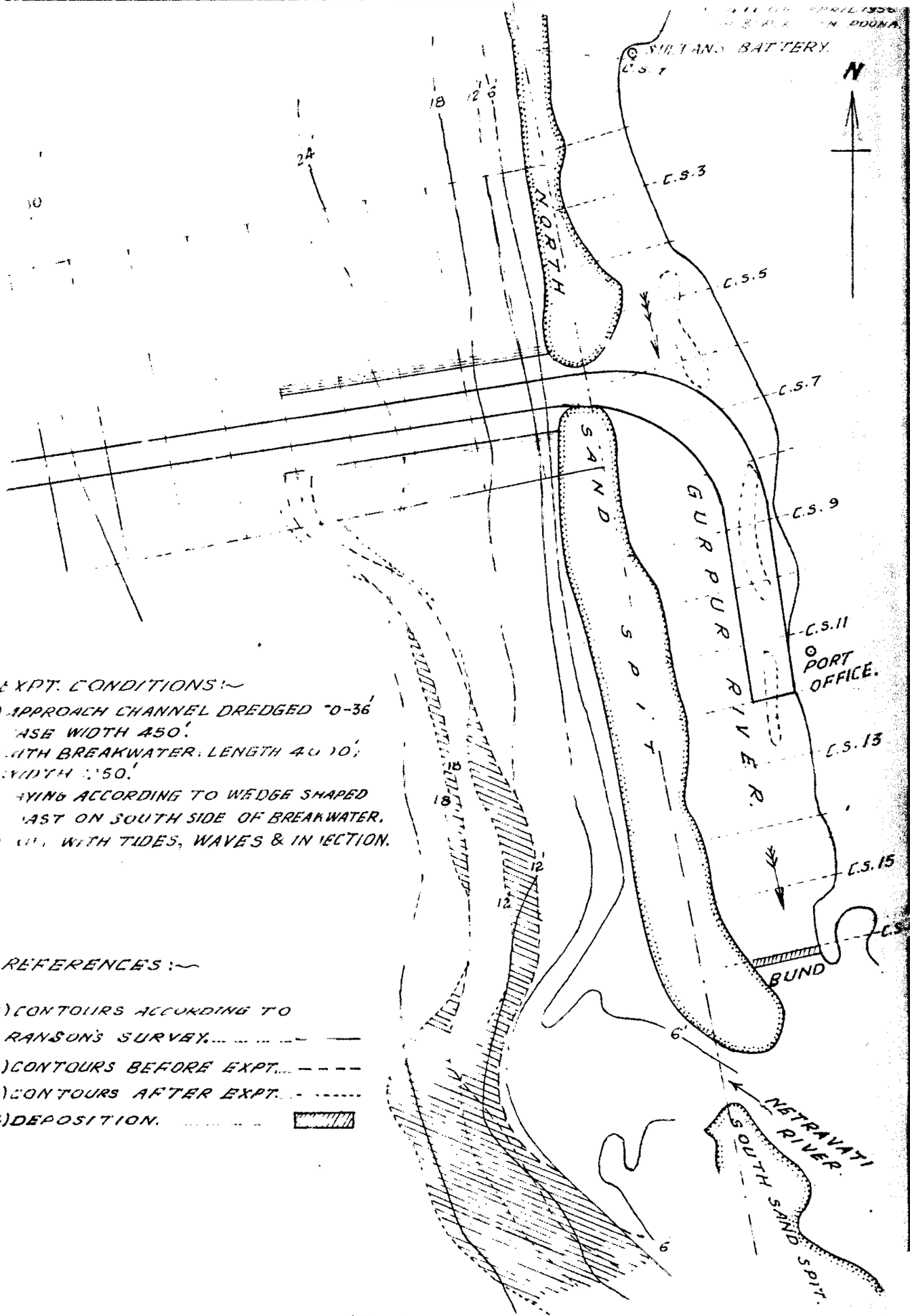


FIG. 6.

1 : 50:1/50 MANGALORE PORT MODEL

SCALE: 1"=8' IN MODEL. = 2000'

PLAN SHOWING THE EFFECT OF BREAKWATER AFTER THE STABILIZATION OF COAST LINE UNDER NEW SET OF CONDITIONS.

PROPOSAL OF THE APPROACH CHANNEL THROUGH SAND SPIT.

ATRE. H.D'MAN.
C.W.&P.R.STN. POONA.

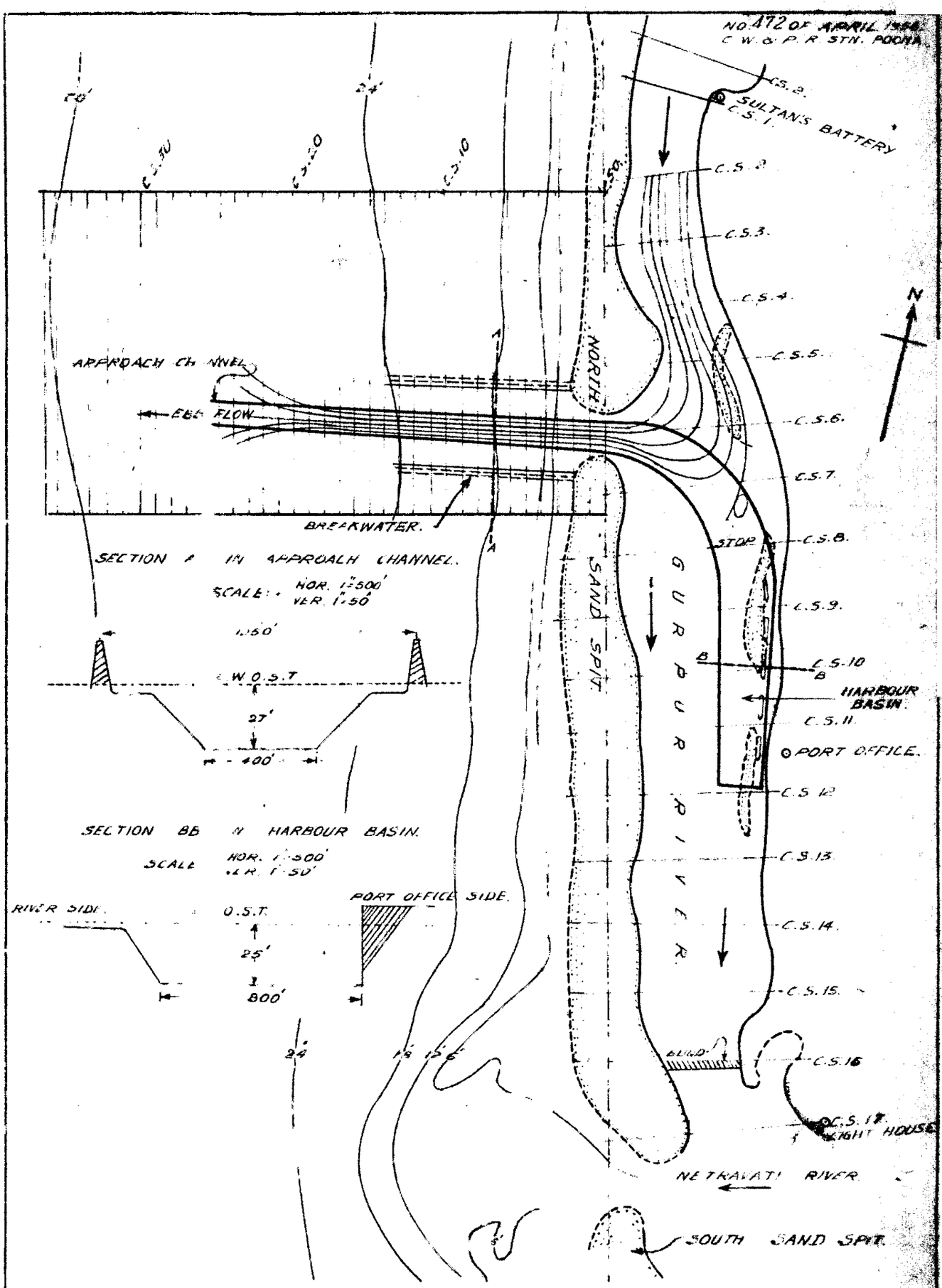


FIG : 7

1/250 1/50 MANGALORE PORT MODEL

PLAN SHOWING LINES OF FLOW OBSERVATIONS IN THE GURPUR RIVER. PROPOSAL OF A CHANNEL THROUGH SANDSPIT

SCALE 1" = 2000'

DRAWN E.

C.

D'MAN.

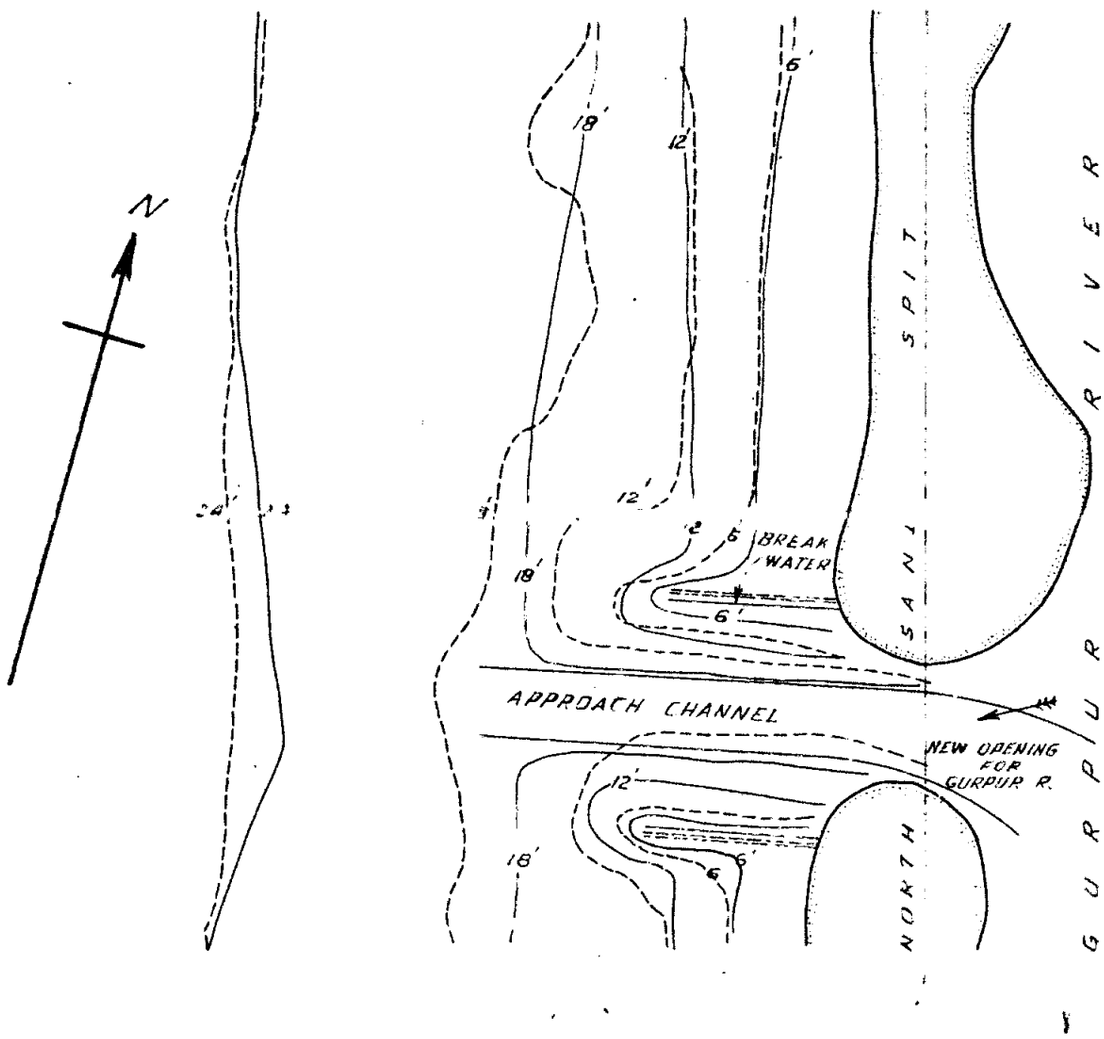
E. C.P.W.S. POONA

EXPERIMENT CONDITIONS

(2) EXPT WITH BREAKWATER 1000' LONG.

(3) EXPT WITH TIDES, WAVES & INJECTION

(4) PERIOD OF RUN 7½ HOURS.



REF:-

1) CONTOURS WITH APPROACH CHANNEL AND BREAKWATER BEFORE EXPERIMENT..... ———

2) CONTOURS WITH APPROACH CHANNEL AND BREAKWATER. AFTER EXPERIMENT ———— —

FIG 8

1/250, 1/50 MANGALORE PORT MODEL

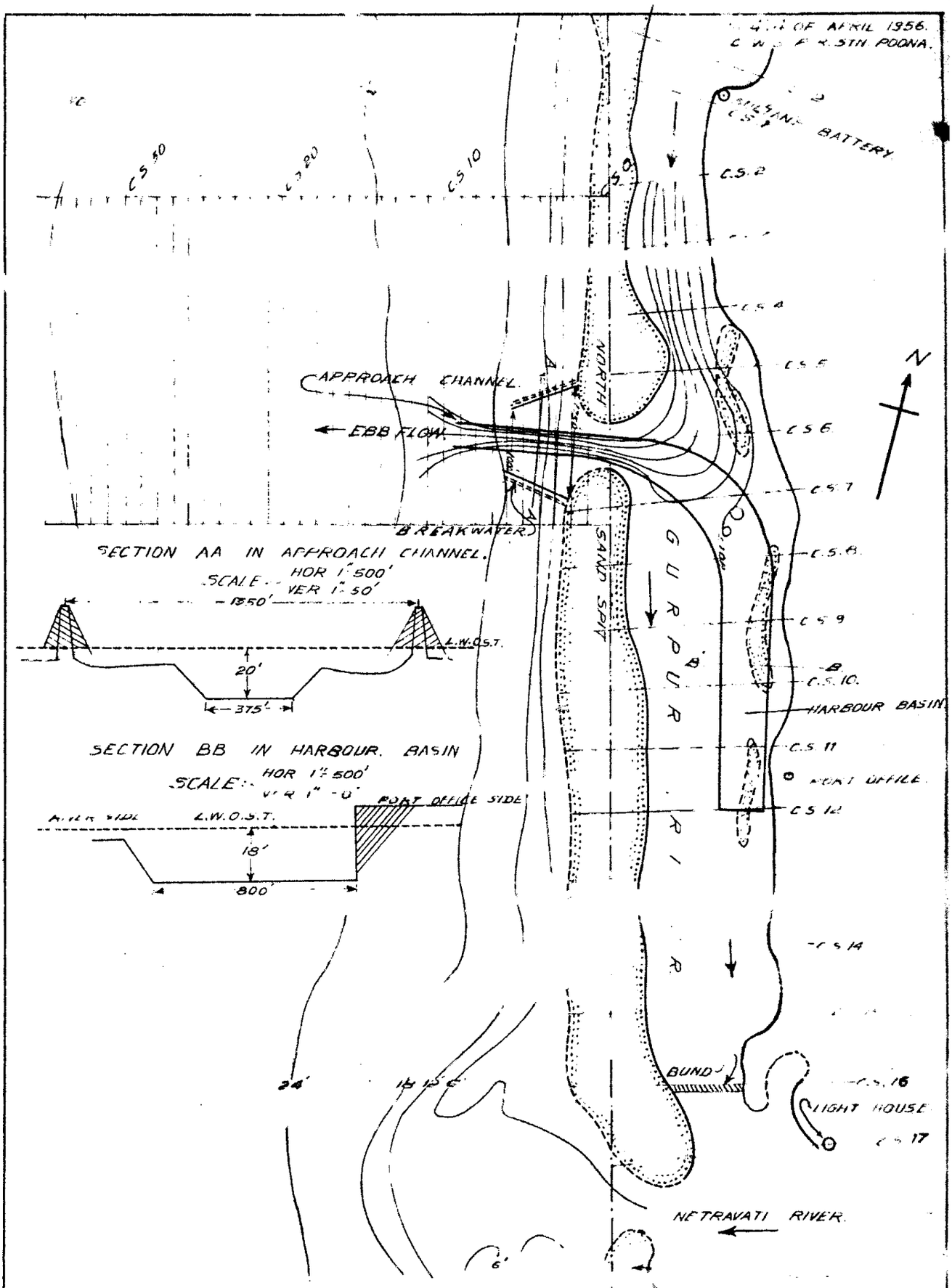
PLAN SHOWING CONTOURS BEFORE AND AFTER EXPERIMENT.

PROPOSAL OF A CHANNEL THROUGH SAND SPIT

SCALE 1" = 1000 ft.

IR M.K Sabnis
L.C.M.P. HY

H D'MAN
C.W.&P.R.S POONA



EXPT CONDITIONS:-

(1) APPROACH CHANNEL DREDGED TO -20'
(2) " " WIDTH = 375'
(3) WITH BREAKWATER LENGTH : 1000'
WIDTH AT THE SHORE 1750'
" " " END 1000'
(4) DISCHARGE IN GURPUR RIVER = 80,000 CS

REFERENCES
SURFACE LINES OF FLOW

FIG: 9

$\frac{1}{260}\frac{1}{50}$ MANGALORE PORT MODEL.

PLAN SHOWING LINES OF FLOW OBSERVATIONS IN THE GURPUR RIVER. PROPOSAL OF A CHANNEL THROUGH SAND SPIT

SCALE 1"=1000'

TR. RFUT S.E. COMA

M. D'MAN. C W & P R.STN POONA